

# Tupolev SB

in action



Aircraft Number 194  
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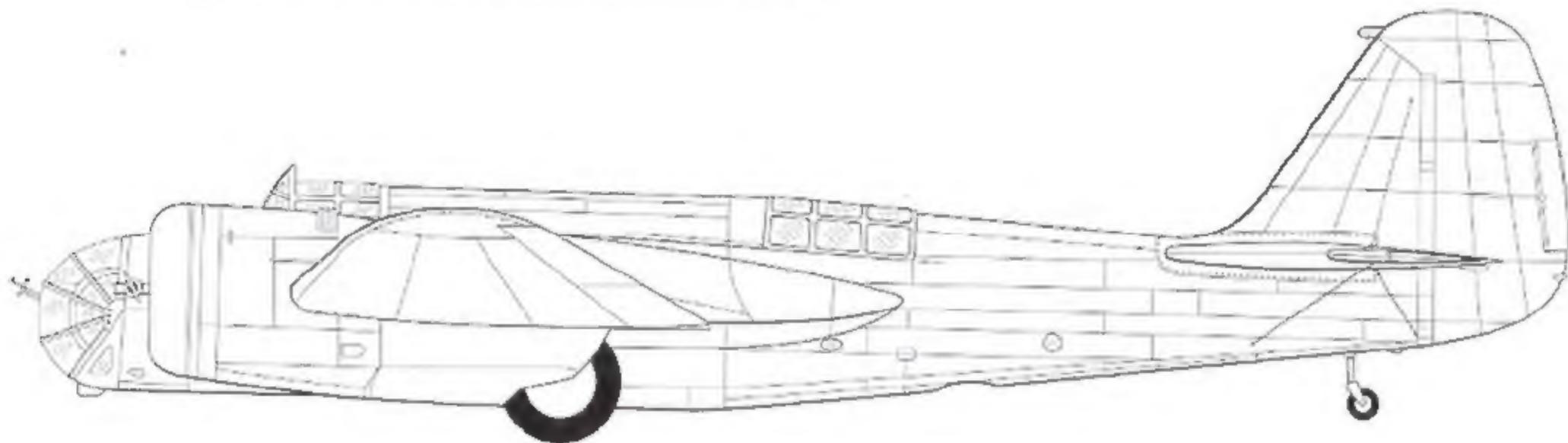
# Tupolev SB

## in action

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Color by Don Greer

Illustrated by David Gebhardt and Darren Glenn



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*Voyenno-Vozdushniye Sily (VVS: Soviet Air Force) Tupolev SB-2-M-100-As – including Red 4 and Red 3 – attacked the railroad station at Buczacz, Poland on 17 September 1939. This raid supported the Soviet invasion of eastern Poland, which began that day. Polish Air Force PZL P.11 fighters intercepted the SBs and downed two of the Soviet bombers.*

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The Tupolev SB was the world's fastest bomber when it entered VVS (Soviet Air Force) service in 1936. It Soviets supplied a considerable number of these bombers to the Republican forces during the Spanish Civil War. Spanish crews nicknamed this aircraft the *Katiuska*, after a character in a popular Spanish operetta. This Grupo (Group) 24 SB-2-M-100-A flies over El Carmoli beach in southeastern Spain in 1938.



# Introduction

The Tupolev SB (*Skorostnoi Bombardirovshchik*; Fast Bomber) was one of the most outstanding bomber designs of the interwar years. It was a masterpiece of the Tupolev *Opytnoe Konstruktorskoe Byuro* (OKB; Experimental Design Bureau). This two-engine aircraft was faster than any Nationalist fighter when it first saw action over Spain in the Fall of 1936. The SB flew with the Chinese Air Force against Japanese forces in the Far East. In mid-September of 1939, it was the backbone of the Soviet Bomber Aviation Regiments that attacked Poland. SBs sustained heavy losses during the Soviet-Finnish Winter War of 1939-40. When the German *Wehrmacht* (Armed Forces) invaded the Soviet Union on 22 June 1941, the SB was the most numerous medium bomber in the *Voyenne-Vozdushniye Sily* (VVS; Soviet Air Force) inventory. Although completely obsolete and an easy prey for the *Luftwaffe* (German Air Force), it remained in frontline service until 1943. For the remainder of the Great Patriotic War<sup>1</sup>, the SB served as a transport and training aircraft, with several employed by the Soviet airline Aeroflot. State Aviation Factories at Fili and Irkutsk completed 6831 SBs between 1936 and 1941. No other Tupolev design before or since equaled the SB's production total.

Soviet *Vodch* (Leader) Iosif Stalin ruthlessly pushed his country's industrialization at the 14th All-Union Communist Party Congress in December of 1925. Extraordinary results were achieved in the heavy industrial sector, but consumer interests were virtually ignored. Soviet heavy industry saw major technological improvement during the first Five-Year Plan (1929-

<sup>1</sup>The Great Patriotic War is the Russian name for the 1941-45 conflict with Germany and its allies. The West calls this the Eastern (or Russian) Front of World War Two.

The first ANT-40 prototype is assembled in the Experimental Workshop of TsAGI (Central Aero and Hydrodynamics Institute) at Kratovo (now Zhukovsky) in August of 1934. Two 710 hp Wright-Cyclone SGR-1820 F-3 radial engines imported from the United States powered the bomber. (Viktor Kullikov)

14). This resulted in 1931 industrial output being more than three times that of 1913. The Soviet Union – under People's Commissar for Heavy Industry Grigorij K. Ordzhonikidze – invested over six million rubles for building new aircraft factories between 1927 and 1933. Soviet factories produced approximately 260 aircraft in 1930. Increased factory space allowed VVS strength to reach 2500 first-line combat aircraft in 1932. This total of military aircraft was greater than in any Western nation of the time. An aid to this extraordinary increase in industrial production was the use of forced labor from the vast labor camps<sup>2</sup> peopled by rebellious peasants and other dissidents.

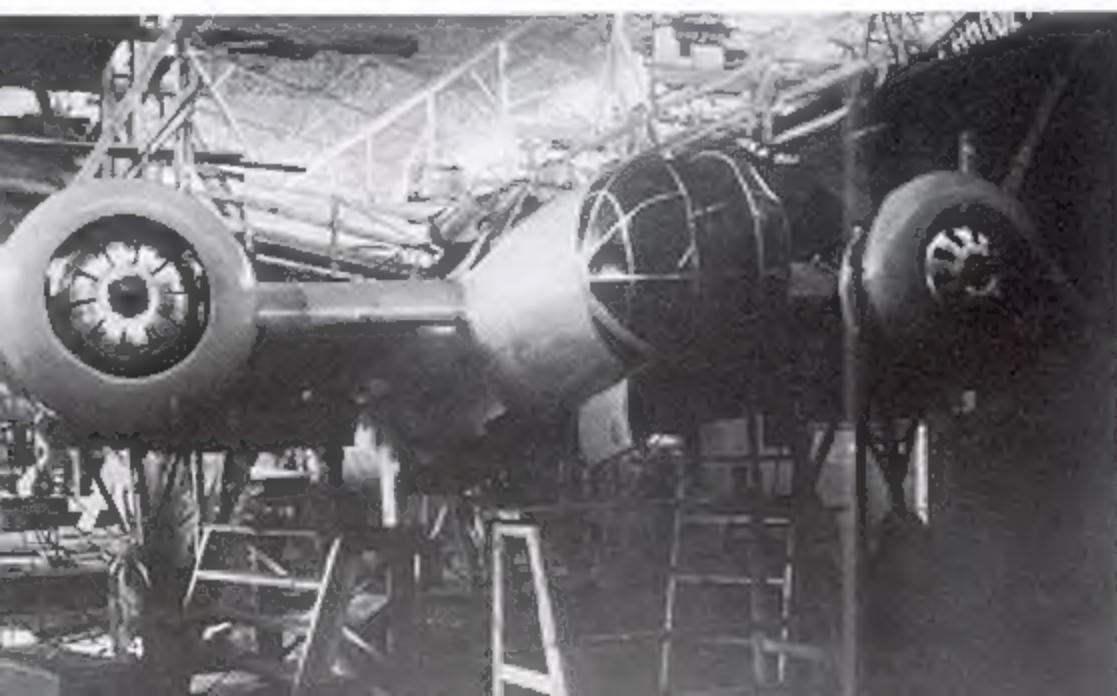
During this period, the Soviet Union developed two aircraft whose technology and performance were half a decade ahead of their rivals in Germany, Great Britain, or the United States. One was the Polikarpov I-16 fighter, while the other was the Tupolev SB. Stalin's purges of real and imagined enemies brought Soviet fighter and bomber development to a standstill in 1935. When the *Wehrmacht* invaded the Soviet Union on 22 June 1941, most frontline fighter and bomber types were the same as in the mid-1930s. The price of Soviet Supreme Command's ignorance was the thousands of Soviet pilots that fought with hopelessly obsolete aircraft against the modern equipped *Luftwaffe*.

## Tupolev ANT-40-1 Prototype

Early Soviet studies of a high-speed bomber concept began in the early 1930s. Speed was

<sup>2</sup>This labor camp system was also called the GULAG (*Glavnii Upravleniye Lagerev*; Main Directorate for Collective Labor Camps).

The ANT-40 prototype first flew from Kratovo on 7 October 1934. It crashed during its ninth flight the following 31 October. The ANT-40 was unarmed and had a small vertical stabilizer (tailfin) in its original configuration. A strut fitted between the tail wheel and the fuselage was removed when the aircraft was repaired after the 31 October 1934 accident. (Viktor Kullikov)



deemed its most effective defense against contemporary fighters; consequently, this new aircraft needed to be faster than potential enemy aircraft. It became clear that only an aerodynamically clean bomber could fulfill that task. The *Tsentral'nyi Aero Gidrodinamicheskiy Institut* (TsAGI; Central Aero and Hydrodynamics Institute) at Kratovo<sup>1</sup> had gathered sufficient information and data for such a project by 1933.

This amount of information had been passed to a Design Department for Experimental Aircraft Construction, which was led by Andrei N. Tupolev. The principal leader for the development of a high-speed bomber was Aleksandr A. Arkhangelsky. The project for a fast two-engined bomber received the designation ANT-40 (Andrei Nikolayevich Tupolev). The Design Department for Experimental Aircraft Construction used the basic data from TsAGI and turned the calculation into hardware. The wing and the control systems were developed by Vladimir M. Petlyakov, who later designed the famous Pe-2 light bomber.

A schedule for producing the ANT-40 prototype was established during a meeting at TsAGI on 21 February 1934. It called for a mock-up to be available by March of 1934 and a prototype powered by Wright Cyclone radial engines to be completed by the following mid-July.

Work on the ANT-40 prototype started on 25 April 1934. This was a twin-engined bomber of all-metal construction with a retractable undercarriage. Its fuselage was of an oval cross section, but was comparatively narrow. This was built in three primary components: front, center, and rear. The fuselage was faired into the wing center section by wide fairings.

The wing spars were of typical Tupolev girder-type construction built up from 30-KhGSA metal tubing, while the ribs were riveted truss with U-section periphery and tubular diagonal bracing. The center section skinning thickness ranged from 0.6mm to 1mm, while that of the outer panels ranged from 0.5mm to 0.6mm. Control surfaces had fabric-covered metal structures. The airframe structure was comprised of U-section frames and stringers, including pressed sheet mainframes. The main landing gears, with their single oleo (shock absorbing) legs and welded jacks, were hydraulically raised aft into the rear of the engine nacelles, with much of the wheel remaining exposed.

This prototype had flush rivets on all external surfaces. The framework and the thin skinning were stamped with conical rivet heads. This method proved to be impractical for mass production.

The first ANT-40 prototype was powered by two 710 hp Wright Cyclone SGR-1820 F-3 nine-cylinder, air-cooled, radial engines that turned Hamilton three-blade propellers. The Cyclones were delivered directly by the Wright Aeronautical Corporation at Patterson, New Jersey, shortly after the Soviet Union and the United States established diplomatic relations in November of 1933. This made it possible for the Soviets to import some of the latest American engines and other aviation equipment.

The ANT-40 was rolled out in early October of 1934, some three months behind schedule due to unknown production delays. It had a gross weight of 3643 kg (8031 pounds) and a fuel capacity of 940 L (248 gallons). Test pilot I.S. Zhurav was at the controls of the new bomber's maiden flight from Kratovo airfield on 7 October 1934. The ANT-40 made eight flights before

<sup>1</sup>Kratovo, southeast of Moscow, was renamed Zhukovsky in 1947.

The ANT-40 prototype was fitted with a bombsight covering and a venturi tube on the nose following repairs after the accident on 31 October 1934. An additional window was placed under the aft sliding rear canopy. The tailfin was enlarged and a drop-shaped covering fitted over the tail wheel. The lower aft fuselage opening increased the 7.62mm ShKAS machine gun's field of fire. TsAGI is painted in black on the aft fuselage. (Viktor Kulikov)

it crashed on its ninth flight on 31 October 1934. It was taken to a shop at TsAGI for repair, which were completed in February of 1935.

Several modifications were made to the first ANT-40 prototype during this repair. The fuselage was lengthened from 10.4 m (34 feet 1.4 inches) to 12.3 m (40 feet 4.3 inches). Its wing area was reduced from 47.6 m<sup>2</sup> (512.4 square feet) to 46.3 m<sup>2</sup> (498.4 square feet), but the wingspan remained at 19 m (62 feet 4 inches). A machine gun cartridge case ejection tunnel with covering was added under the nose. Venturi tubes for operating vacuum instruments were mounted on both sides of the nose. An oval window was added to the rear fuselage under the gunner's aft sliding canopy. The vertical stabilizer (tailfin) chord (width) was enlarged. A drop-shaped fairing replaced the strut that led from the tail wheel into the fuselage. The field of fire for the ventral 7.62mm ShKAS<sup>2</sup> machine gun was improved by cutting a larger hole in the lower fuselage. A weight-reducing program dropped the ANT-40's gross weight from 3643 kg (8031 pounds) to 3132 kg (6905 pounds). No national markings appeared on the ANT-40, but TsAGI was painted on the rear fuselage after the aircraft was repaired.

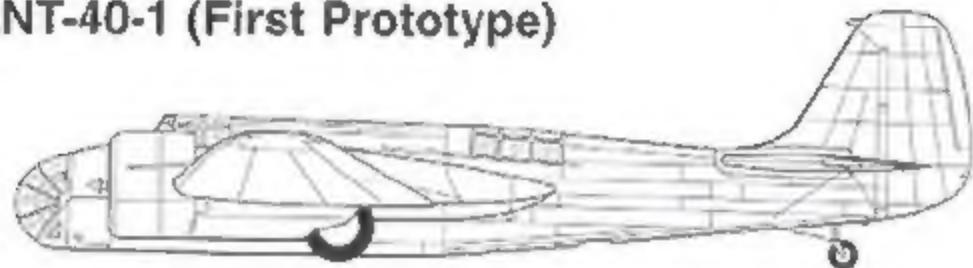
Factory trials were performed at Kratovo airfield between 5 February and 21 June 1935. The ANT-40 reached a speed of 325 kmh (202 mph) at 4000 m (13,123 feet), with a recorded service ceiling of 6800 m (22,310 feet). Despite these results, the VVS favored a Hispano-Suiza 12 Yards-powered ANT-40 and terminated development of the Cyclone-powered ANT-40 prototype. This aircraft was then allocated to TsAGI for experimental work. The first ANT-40 was used to test retractable skis and Hamilton two-pitch propellers from 21 February until 1 March 1936. Importation of the Wright SGR-1820 F-3 was not in vain, as *Gosudarstvennyi Aviatsionnyi Zavod* (GAZ; State Aircraft Factory) 19 at Perm (named Molotov between 1940 and 1957) built it in great numbers under the designation M-25 (Motomyl; Motor). This engine powered the Polikarpov I-152 and many I-16 fighters.

<sup>2</sup>ShKAS: Shpal'tovskiy Komissariatskii Aviatsionnyi Montazhnyi Skladi'ny-Konstruktivnyi Aviation Rapid Firing (machine gun)

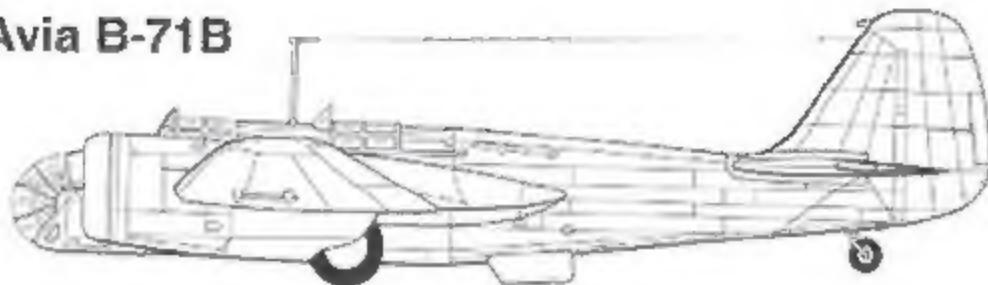


# Development

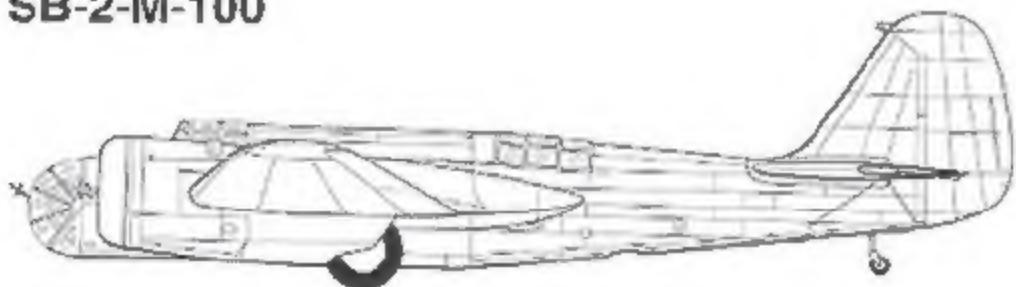
**ANT-40-1 (First Prototype)**



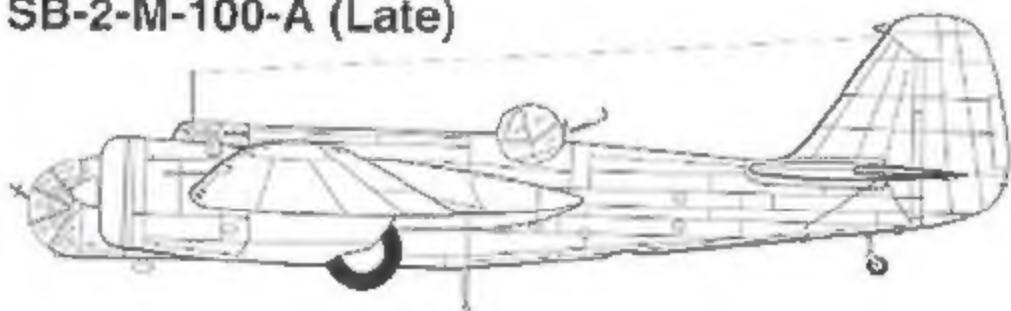
**Avia B-71B**



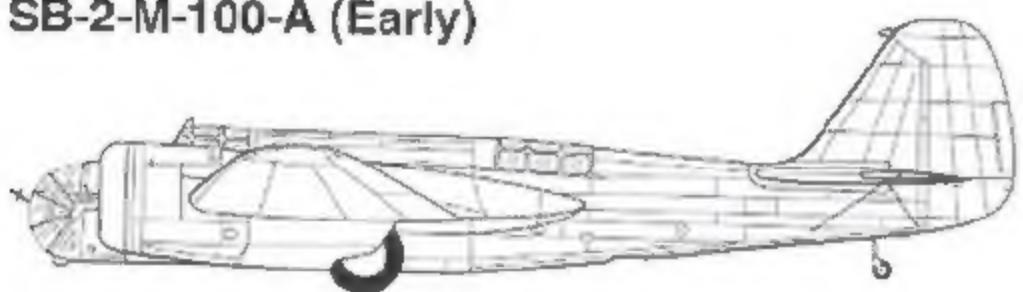
**SB-2-M-100**



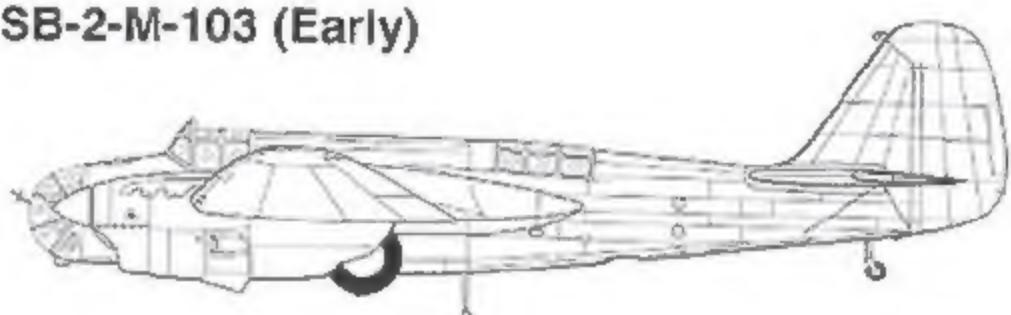
**SB-2-M-100-A (Late)**



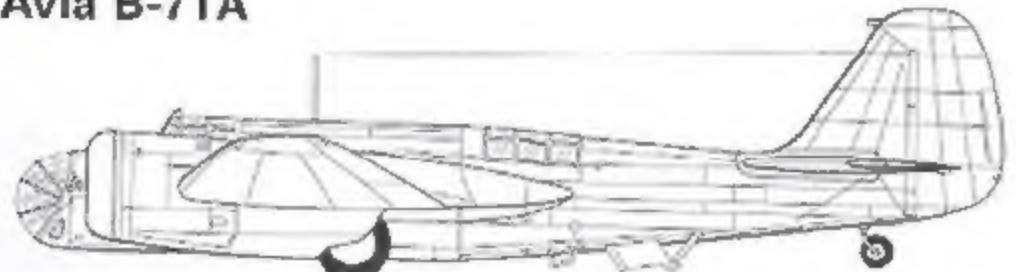
**SB-2-M-100-A (Early)**



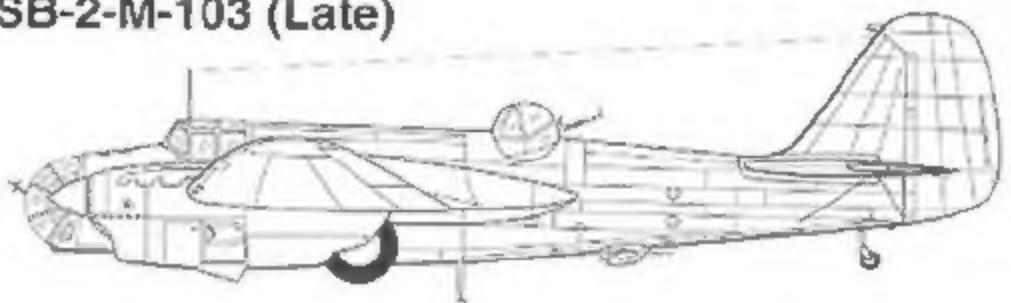
**SB-2-M-103 (Early)**



**Avia B-71A**



**SB-2-M-103 (Late)**



# Tupolev ANT-40-2 Prototype

Parallel to the first ANT-40-1 prototype powered by two Wright Cyclone SGR-1820 F-3 engines, a second bomber was assembled with an alternative powerplant. The ANT-40-2 received two Hispano-Suiza 12 Ybres engines that were imported from France.

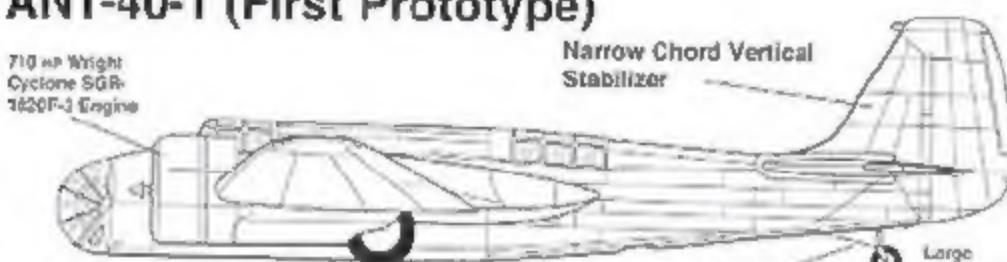
The 12 Ybres was rated at 780 hp at 260 rpm -70 hp more than on the American engine. This 12-cylinder, liquid-cooled engine had a volume of 36 l (2197 cubic inches). Swiss engineer Marc Birkigt had developed the French powerplant in 1934. The Soviets regarded the Hispano-Suiza 12 Ybres as more promising for its new fast bomber than the Cyclone and selected the former for the new aircraft.

ANT-40-2 construction began on 15 May 1934, some three weeks after construction began on the first prototype. The second prototype was regarded as a basis for the serial production aircraft.

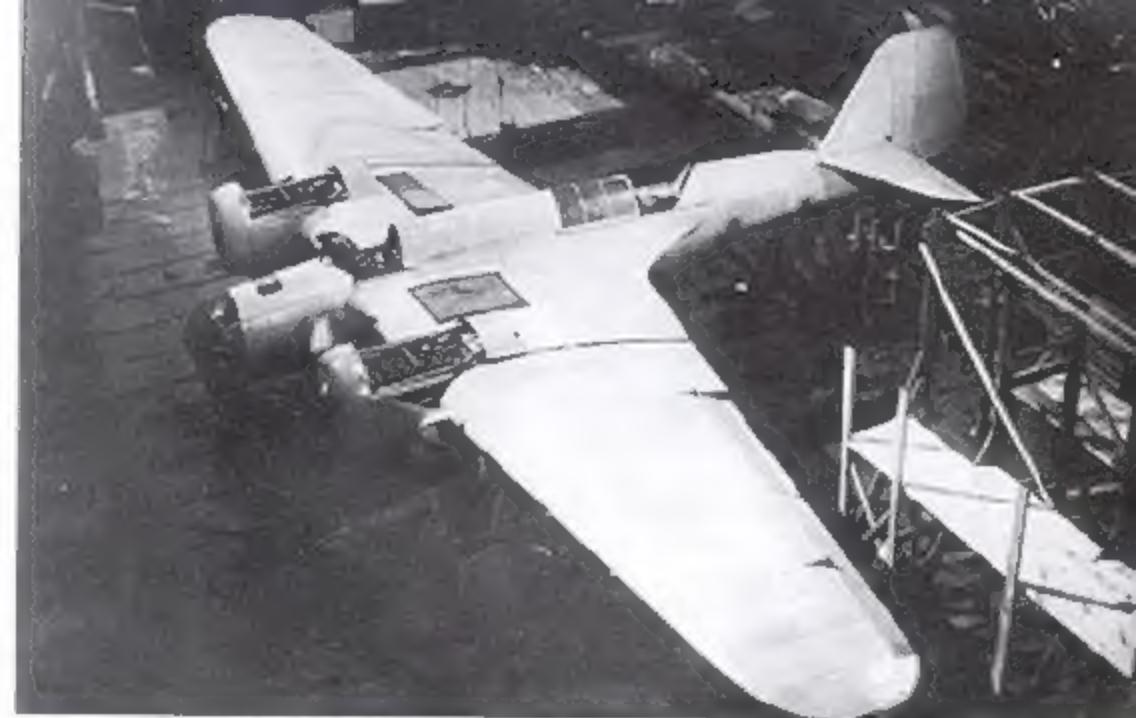
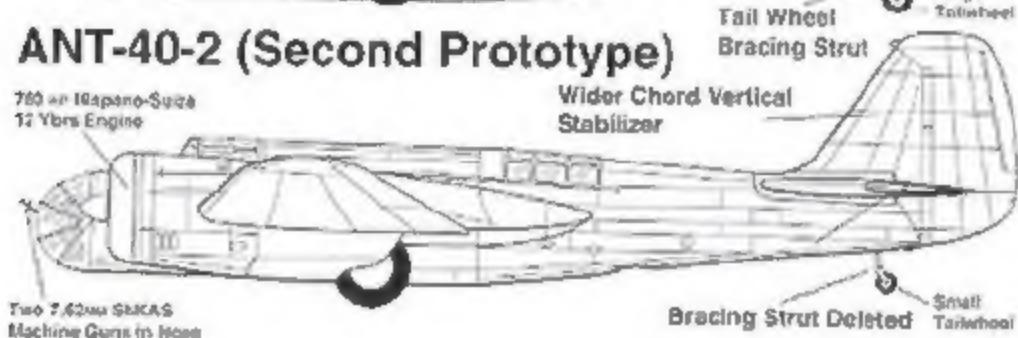
The ANT-40-2 differed in several details from the ANT-40-1's original configuration. The wingspan was extended from 19 m (62 feet 4 inches) to 20.3 m (66 feet 7.2 inches), while an enlarged chord resulted in the wing area's increase from 46.3 m<sup>2</sup> (498.4 square feet) to 52 m<sup>2</sup> (559.7 square feet). The fuselage was stretched from 12.3 m (40 feet 4.3 inches) to 12.7 m (41 feet 8 inches). Fuel capacity was increased from 940 l (248 gallons) to 1670 l (441 gallons) in four wing tanks. Larger cowlings with horizontal coolant radiator shutters enclosed the longer 12 Ybres engines. The ANT-40-1 employed three-bladed Hamilton propellers, while the ANT-40-2 received Soviet-built two-bladed V-100 propellers. Short exhaust stacks flanked the ANT-40-1's engine nacelles, while the ANT-40-2's engine exhausts were located on the upper nacelles. Three exhaust outlets were added to the lower nacelles, plus an additional outlet in the rear lower nacelle section.

The ANT-40-2's tailfin chord was increased for improved stability. Circular windows replaced oval windows on the first prototype's aft fuselage sides and improved the rear gunner's view. The ANT-40-1 was unarmed, but the second prototype was armed with two 7.62mm ShKAS machine guns in the nose. The bombardier/navigator aimed these weapons using a PMP-3 gun sight. The tail wheel strut was deleted and a smaller diameter tail wheel was installed.

## ANT-40-1 (First Prototype)

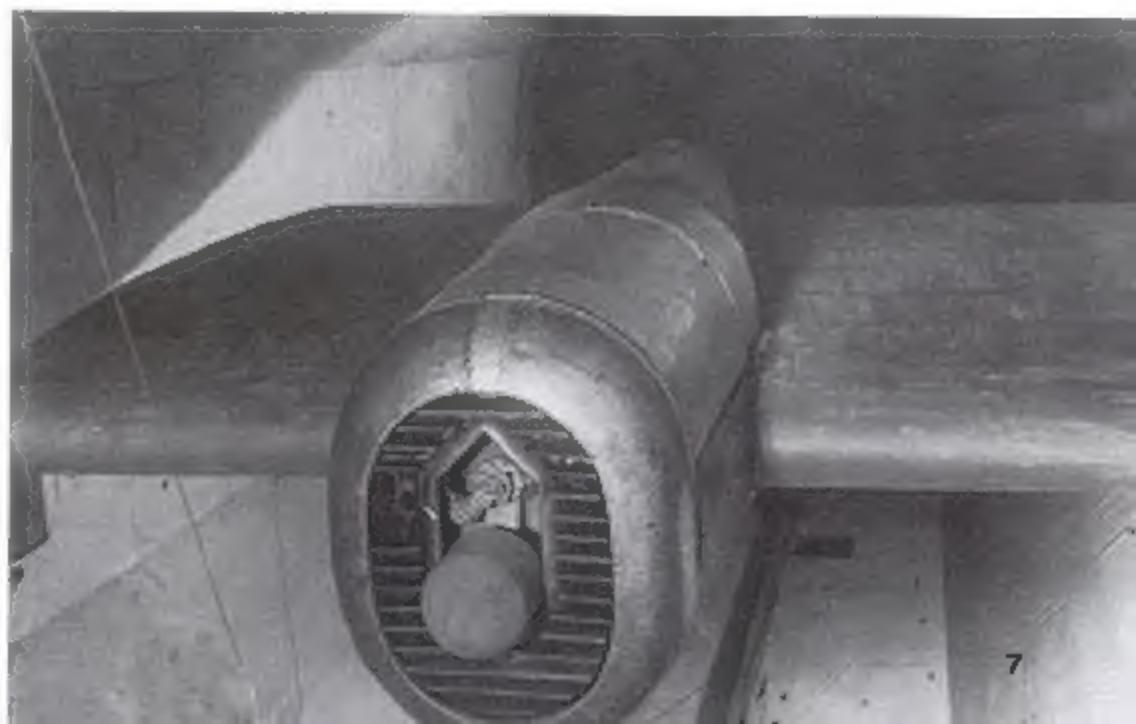


## ANT-40-2 (Second Prototype)



The second ANT-40 prototype (ANT-40-2) is assembled in the TsAGI Experimental Workshop in July of 1934. More powerful 780 hp Hispano Suiza 12 Ybres inline engines were installed on this aircraft. Enlarged engine cowlings allowed for the installation of the 12-cylinder powerplants. (Viktor Kulikov)

The left 12 Ybre engine is enclosed within its cowling on the ANT-40-2 placed in the TsAGI wind tunnel. Radiator shutters were placed horizontally on the ANT-40-2, but were mounted vertically on subsequent production SB-2-M-100s. Production aircraft replaced the prototype's diamond-shaped propeller aperture with a rectangular opening. (Viktor Kulikov)





The ski-equipped ANT-40-2 prototype is parked during the State Acceptance Trials from October of 1935 until April of 1936. These skis allowed the aircraft to fly from snow-covered airfields. Two 7.62mm ShKAS machine guns were fitted to the nose of this aircraft. (Viktor Kulikov)

A 7.62mm ShKAS machine gun is mounted in the TUR-9 dorsal ring-type mount. The radio operator manned this weapon, along with the ventral ShKAS. During combat, the rear canopy was opened for increased field of fire for the weapon. Although the oval window below the wing root indicates this is the ANT-40-1, this same gun was also employed on the later ANT-40-2 and production SBs. (Viktor Kulikov)



The ANT-40-2 was reassigned to the State Acceptance Trials on 9 April 1935, following some modifications to correct aileron flutter problems. The nose armament had been removed and the nose glazing covered. A grounding wire runs from the right wing under-surface to the hardstand. (Viktor Kulikov)

Test pilot I.S. Zhurov flew the ANT-40-2 on its initial flight on 30 December 1934. This began factory tests that lasted until 21 January 1935. During these trials, the ANT-40-2 attained a top speed of 368 kmh (229 mph) at ground level and 430 kmh (267 mph) at 5000 m (16,404 feet). It climbed to 5000 m in 6.75 minutes. The ANT-40-2's performance considerably exceeded the VVS's specified tactical and technical requirements.

The ANT-40-2's State Acceptance Trials began at Kralovo on 8 February 1935, but they were stopped due to aileron flutter on 3 March 1935. It took several days to eliminate the defect by installing mass balances in the ailerons. Flight tests resumed on 9 April 1935 until 17 July 1935. Both nose-mounted 7.62mm ShKAS guns were deleted and protective materials were fitted over the nose glazing during these trials. After these tests ended, the ANT-40-2 was returned to the TsAGI Experimental Workshop, where several additional defects were eliminated. The ANT-40-2 resumed State Acceptance Trials from October of 1935 until April of 1936. A ski undercarriage for operations from snow-covered airfields replaced the standard wheeled landing gear during this phase of the trials. After successful completion of these tests, the ANT-40-2 was flown to GAZ (State Aircraft Factory) 22 S.P. Gorbunov<sup>1</sup> at Fili, near Moscow. It served as a pattern aircraft for mass production, which began in the former Junkers plant.

<sup>1</sup>S.P. Gorbunov became director of the Junkers aircraft factory at Fili in 1923. It came under full Soviet control as GAZ-2 in 1927 and was renamed GAZ-22 one year later.

# Tupolev SB-2-M-100

Even before the first ANT-40-1 was completed, Soviet authorities decided to place the Tupolev SB into mass production. Aleksandr A. Arkhangelsky and his staff were sent to Fili in order to supervise the production preparations. Drawings for the production aircraft were submitted to GAZ (State Aircraft Factory) 22 S.P. Gorbovov on 20 February 1935. Production at this plant switched from the Tupolev TB 3 four-engined bomber to the SB-2-M-100 that spring. GAZ 22 workers had lengthy difficulties in mastering assembling techniques for the new bomber. They faced troubles in properly using sunken rivets. This resulted in using rivets with potted heads on much of the airframe, which left the sunken head rivets for the wing leading edges and control surfaces. The use of two different types of rivets violated the technology of riveting and resulted in 'cracks appearing on concave surfaces of early production aircraft.

The Soviet industry's failure to master new technologies subsequently led to their purchase of technology documents in the United States. The Soviet Union bought 20,000 tooling machines worth 70 million US dollars for its aviation industry.

While two 780 hp Hispano-Suiza 12 Ybxs engines powered the ANT-40-2 prototype, production aircraft used the 750 hp Klimov M-100. It was a Soviet copy of the Hispano-Suiza 12 Ybxs, but with 30 hp less power than the original French engine.

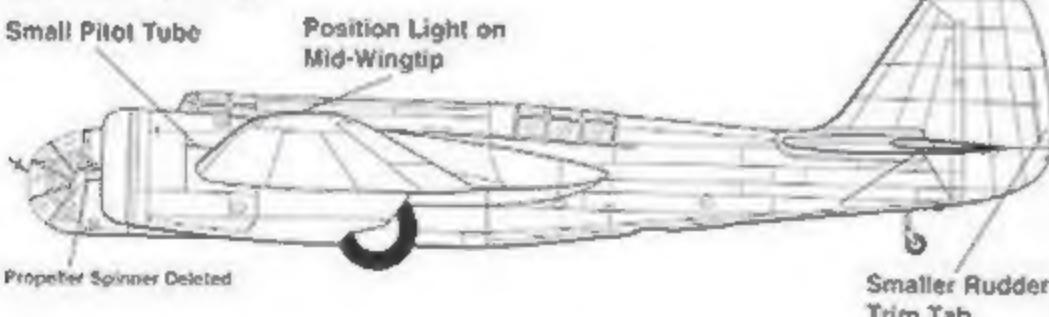
The Tupolev SB-2-M-100 could carry an internal bomb load of either two 250 kg (551-pound) FAB-250<sup>1</sup> bombs or six 100 kg (220-pound) FAU-100 general-purpose bombs. Defensive armament consisted of four 7.62mm ShKAS machine guns. Two guns were mounted in the nose, a third weapon was located in the upper aft fuselage, and a fourth gun placed in the lower aft fuselage.

<sup>1</sup>FAU- Fagocorvo Aviacionnaya Bomber, General Purpose Aviation Bomb.

## ANT-40-2



## SB-2-M-100



Empty weight increased from the ANT-40-2's 3217 kg (7092 pounds) to 4060 kg (8951 pounds) for the SB-2-M-100. The wingspan increased from 20.3 m (66 feet 7.2 inches) on the ANT-40-2 to 20.33 m (66 feet 8.4 inches) on the SB-2-M-100, while the fuselage length was reduced from the ANT-40-2's 12.7 m (41 feet 8 inches) to the SB-2-M-100's 12.3 m (40 feet 4.3 inches). The SB-2-M-100 was crewed by three men: pilot, navigator/bombardier, and radio operator/rear gunner.

There were several other differences between the ANT-40-2 prototype and the standard production SB-2-M-100. Vertically placed shutters on the SB-2-M-100 replaced the prototype's horizontal coolant radiator shutters. A rectangular propeller aperture replaced the ANT-40-2's diamond-shaped opening. The three exhaust outlets on the ANT-40-2's lower engine cowling were deleted. The left pilot tube was reduced in size on the production SB-2-M-100. The wingtip position lights were relocated from the front to the center, the tail surfaces were enlarged, and the tail bracing cables were lengthened. Additionally, a rudder mass balance was added atop the rudder. Both the rudder trim tab and the rudder position light covering were reduced in size on the production aircraft. The ANT-40-2 was equipped with a single venturi tube on the right-side nose, while the SB-2-M-100 had two venturi tubes attached on that side.

The first SB-2-M-100 (serial number 22-1) was completed at GAZ 22 in early 1936. Six SB-2-M-100s of the first production batch were handed over to the VVS for operational trials that lasted between 26 March and 31 July 1936. During these tests, a top speed of 391 kmh (243 mph) was recorded at an altitude of 5000 m (16,404 feet). GAZ 22 produced 268 SB-2-M-100s by the end of 1936, with 31 of these shipped to Spain.

The SB-2-M-100 had vertical coolant radiator shutters, instead of the ANT-40-2 prototype's horizontal shutters. Rectangular propeller apertures were standard on this variant. Unusually, the propeller blades are camouflaged to match the upper surface colors. An additional venturi tube was mounted on the right nose of the production aircraft. This particular SB-2-M-100 belonged to the first consignment of bombers shipped to Spain. After the Spanish Civil War, it served as 20W-1 in the 13<sup>o</sup> Regimiento de Bombardeo (Bomber Regiment) at Los Llanos. (Juan Arnez Cerdas)



## Tupolev SB-2-M-100-A



The SB-2-M-100-A differed from the earlier SB-2-M-100 in having a step mounted below the emergency exit roof hatch on the nose and a cartridge case ejection tunnel below the nose glazing. Red wing and fuselage bands were painted on Spanish Republican aircraft. (Museo del Aire)



In late 1936 the 860 hp Klimov M-100-A engine became available. It weighed 480 kg (1058 pounds), which was only five kg (11 pounds) heavier than the M-100, but offered a remarkable 110 HP more output. The M-100-A burned 85 octane aviation gasoline, while the M-100 used 90-octane fuel. The first SB equipped with the new engine was the SB-2-M-100-A (22-200) completed at GAZ (State Aircraft Factory) 22 at Tbil. The SB-2-M-100-A reached 423 kmh (263 mph) at an altitude of 4000 m (13,123 feet), which was 42 kmh (26 mph) faster than the SB-2-M-100. There were some internal changes made in order to eliminate defects from previous production batches. This resulted in the gross weight increasing from 5628 kg (12,407 pounds) on the SB-2-M-100 to 5732 kg (12,637 pounds) on the SB-2-M-100-A. SB-2-M-100-A's built in the Summer 1938 had four self-sealing fuel tanks in the wings with a total capacity of 1620 L (441 gallons).

Each of the two nose-mounted 7.62mm ShKAS machine guns was supplied with 860 rounds of ammunition. These weapons traversed 20° to each side and had an elevation range of +50° to -5°. The rear upper TU-R-9 mount with a single ShKAS had an ammunition supply of 1000 rounds and the lower rear gun position was supplied with 510 rounds of ammunition.

There were a number of differences between the SB-2-M-100 and the SB-2-M-100-A. The M-100-A powered SB received a V-shaped step on the right side below the bombardier's nose emergency exit roof hatch. Additionally, a cartridge case ejection chute was added to the nose. This device discharged the cartridges of the two nose mounted ShKAS weapons. Some SB-2-M-100-A's were equipped with a rear view mirror atop the canopy frame. A few aircraft were equipped with RPK-2 Radio Direction Finder (RDF) antennas aft on the lower nose access doors. Aircraft built at GAZ 125 *Imeni Stalina* (Named for Stalin) at Irkutsk were equipped with a longer propeller hub on the V-100 propeller. The first SB-2-M-100-A left the production lines at GAZ 22 and GAZ 125 in early 1937. This variant was supplied to Spain and China.

GAZ (State Aircraft Factory) 125 at Irkutsk built this SB-2-M-100-A, which served with the Chinese Air Force. Aircraft completed at this plant had longer propeller hubs than on standard production V-100 propellers. All SBs had single wheel main landing gears, which retracted aft into the nacelles. (San Diego Aerospace Museum via Ray Wagner)

# Katiuska in Spain

Early in the Spanish Civil War, the Soviet freighter KOMSOMOL carried the first 31 of 100 SB-2-M-100s from Odessa to Spain. The Spanish Republican Government purchased these bombers for 110,000 US dollars per aircraft. These SBs belonged to one of the first production batches completed at GAZ-22. The SB-2-M-100s were unloaded at Cartagena, Spain, on 5 October 1936 and assembled at Los Alcazares airfield. The aircraft were allocated to *Grupo* 12, which also operated Polikarpov I-15 and I-16 fighters. Most *Grupo* personnel were Soviet, although some Spanish and international volunteers were assigned to *Grupo* 12 from the unit's formation. Almost immediately upon its arrival in Spain, the SB-2-M-100 was nickname the *Katiuska* by the Spaniards. (*Katiuska* was the name of a Russian character in a popular Spanish operetta of the time.)

The SBs flew their first combi-mission on 28 October 1936, when *Grupo* 12's 1<sup>o</sup> Escuadrilla (Squadron) under the command of Ernst Schachner took off from Talavera de la Reina base in Seville. After dropping the bombs, the aircraft flew off at a speed that no Nationalist fighter could hope to match, causing much consternation among the Nationalists.

On 1 November 1936, three *Katiuskas* attacked Gamonal airfield and destroyed six Fiat CR 32 biplane fighters on the ground. Two CR 32s shot down an SB 2 M 100 over Talavera the next day. The first loss of a *Katiuska* demonstrated its main shortcomings: the lack of both crew armor protection and self-sealing fuel tanks. Aircraft of the newly created German Legion Condor was the target on 6 November 1936, when two Heinkel He 51 fighters were destroyed at Avila. Small groups of *Katiuskas* were busy attacking Nationalist airfields in November and December of 1936. The first Spanish Nationalist pilot claimed a kill over an SB-2-M-100 on 7 December 1936, when Bermudez de Castro in a CR-12 downed a Soviet bomber over Castilblanco. *Grupo* 12 had lost six of its 31 *Katiuskas* for various reasons by the end of 1936.

In January of 1937, the 1<sup>o</sup> and 2<sup>o</sup> Escuadrillas' SB-2-M-100s flew missions from Málaga against Nationalist troops advancing towards Málaga. Nationalist strong points at Ceuta and North Africa were bombed on 20 January. During early March, the *Katiuskas* attacked the German expeditionary force in Spain during its offensive against Guadalajara. On 29 May 1937, two SB-2-M-100s mistakenly attacked the German pocket battleship DEUTSCHLAND near Ibiza. DEUTSCHLAND was moderately damaged in the attack.

The SS AL DFC OA arrived at Cartagena with 21 more *Katiuskas* on 24 June 1937. Ten more bombers arrived aboard the SS ARTEO MENDI the following 1 July. This second consignment featured the new, more powerful SB-2-M-100-As. The 31 *Katiuskas* were assembled at San Javier and Lorca. They were not only assigned to *Grupo* 12, but also to the newly formed all-Spanish *Grupo* 24. The latter's two squadrons flew their first combat mission on 30 June 1937, when they raided Talavera, Salamanca, and Avila.

Both *Grupos* were involved in the Battle of Brunete that was launched by the Republicans on 6 July 1937. Two days later, a Fessen Condor Messerschmitt Bf 109B fighter downed a *Katiuska*. On 12 July, a *Katiuska* shot down a Bf 109B that was attacking the *front*.

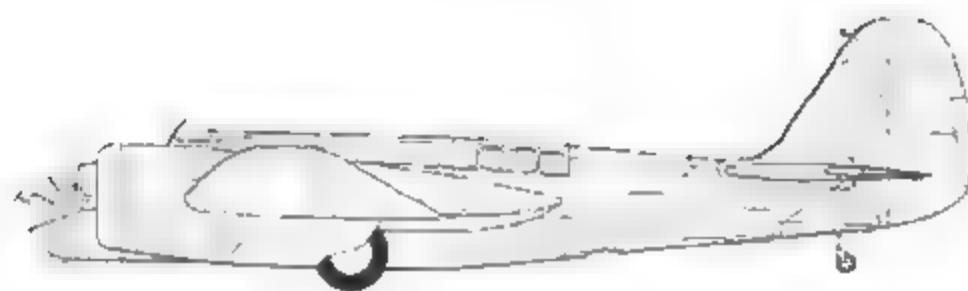
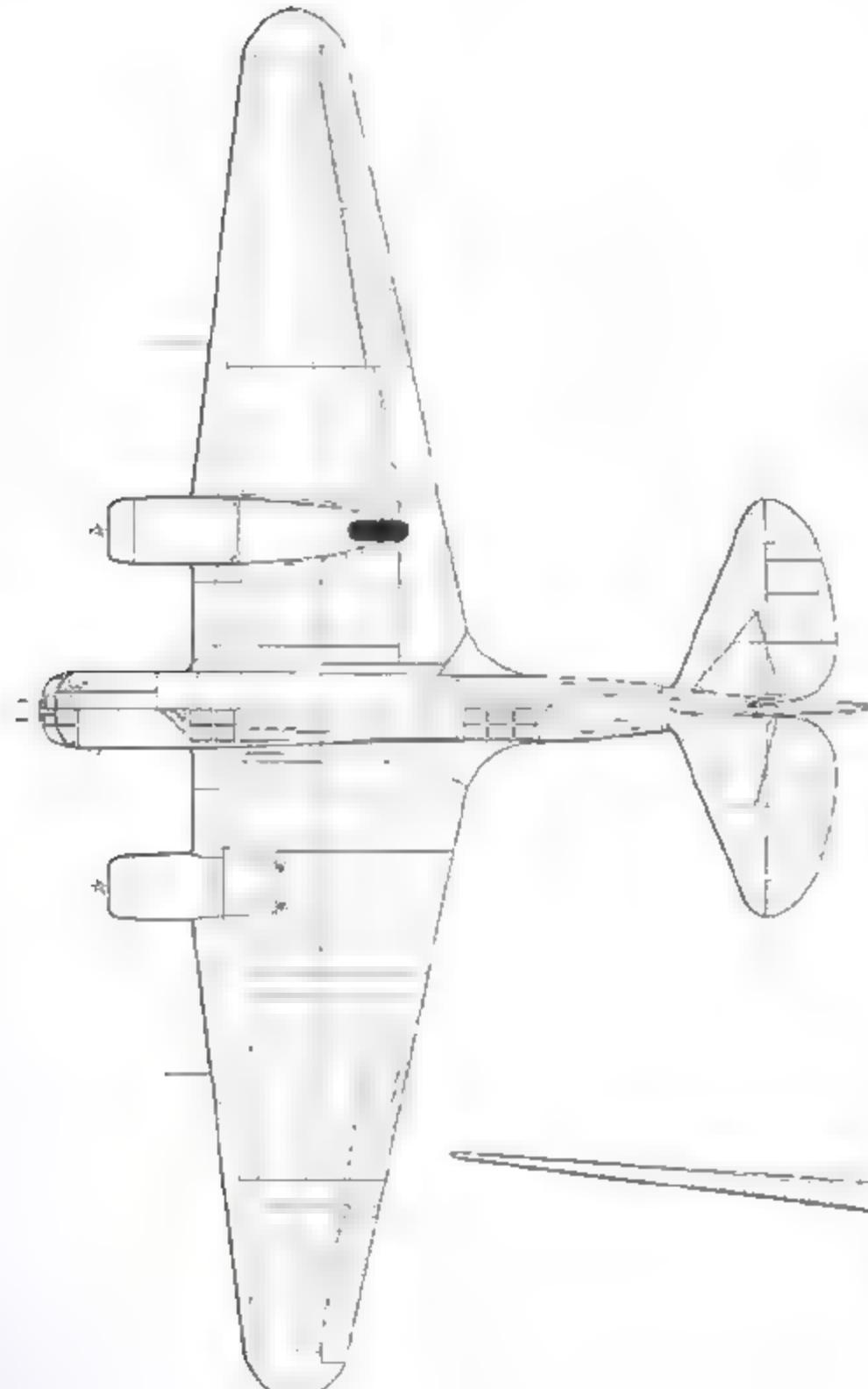
Soviet crews were withdrawn and replaced by Spanish personnel from the fall of 1937. *Grupo* 12 was disbanded and all its *Katiuskas* were reassigned to *Grupo* 24. With the appearance of the Bf 109B and its experienced pilots, the *Katiuskas*' losses mounted. Four bombers were shot down on 7 February 1938—the largest loss on a single day. Only eleven were serviceable in June of 1938. The next month, a further 31 SB-2-M-100A were delivered via Lleida and assembled at Figueras. This increased the total number of *Katiuskas* delivered to



This SB-2-M-100-A (White 46/BK-069) is parked at Barajas airbase, where *Grupo* (Group) 24 surrendered to the Nationalists on 30 March 1939. The serial number is black on the red aft fuselage band. Rudder stripes on Republican aircraft were (from top) red, yellow, and purple. (Museo del Aire)

A large windshield is fitted in front of the rear compartment of this SB-2-M-100-A (White 34/BK-077). This was a Spanish modification performed on several SBs during the Civil War. This *Katiuska* previously served with the *Grupo* 24 and is equipped with a rear view mirror on the canopy frame. The serial number's BK prefix stood for *Bombardeo Katiuska* (Bomber *Katiuska*). (Museo del Aire)





## Tupolev SB-2-M-100-A Specifications

Wingspan: ..... 20.9 m (66 feet 7.2 inches)

Length: ..... 12.3 m (40 feet 4.2 inches)

Height: ..... 3.6 m (11 feet 9.7 inches)

Empty Weight: ..... 4138 kg (9123 pounds)

Maximum Weight: ..... 5732 kg (12,637 pounds)

Powerplant: ..... Two 860 HP Klimov M-100-A 12-cylinder, liquid-cooled, inline engines.

Armament: ..... Two 7.62MM ShKAS machine guns with 860 rounds per gun in the nose, one ShKAS with 1000 rounds in dorsal position, and one ShKAS with 500 rounds in ventral position. Maximum bomb load of 600 kg (1323 pounds).

### Performance:

Maximum Speed ..... 423 kmh (263 MPH) at 4000 m (13,123 feet)

Service Ceiling: ..... 9560 m (31,365 feet)

Range: ..... 1450 km (901 miles)

Crew: ..... Three

Spain to 93 aircraft.

One distinctive Spanish modification in the late war period was the introduction of a fairing in front of the rear gunner's compartment. This offered improved airflow protection for the rear gunner. Some *Katiuskas* had a window in the floor aft of the pilot's compartment. The Republicans assigned each SB a serial number that included the prefix BK (Bombardeo Katiuska/Bomber Katiuska) and a three-digit number. This was painted in black on the aft fuselage. Additionally, SB 2-M-100 As had a large white two-digit tactical number painted on the tailfin.

Nationalist air superiority and the *Katiuska* crews' inexperience quickly reduced the numbers of SBs available to the Republicans. The victorious Nationalists captured 19 SB-2-M-100-As at the Spanish Civil War's end in late March of 1939. They were assigned to the 13<sup>o</sup> *Regimiento de Bombardeo* (Bomber Regiment) at Los Llanos, Albacete. Lack of spare parts resulted in the Spanish grounding the SB fleet in December of 1943, while Junkers Ju 88A bombers replaced the *Katiuskas* in service. The last two remaining SB-2-M-100-As were scrapped in 1948.



This SB-2-M-100-A (White 49/BK-049) is parked in a roofless hangar at Barajas airbase after the Spanish Civil War ended. Grupo 24 surrendered 19 SB-2-M-100-As to the victorious Nationalists at Barajas on 30 March 1939. The Nationalists painted a yellow band over the center of the red aft fuselage band. (Carlo Lucchini)

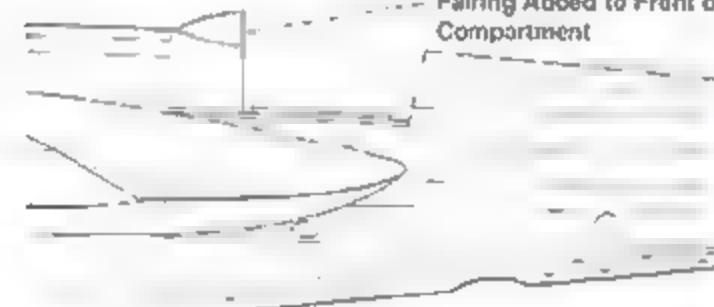
## Rear Canopy Development

**SB-2-M-100-A  
(Standard)**

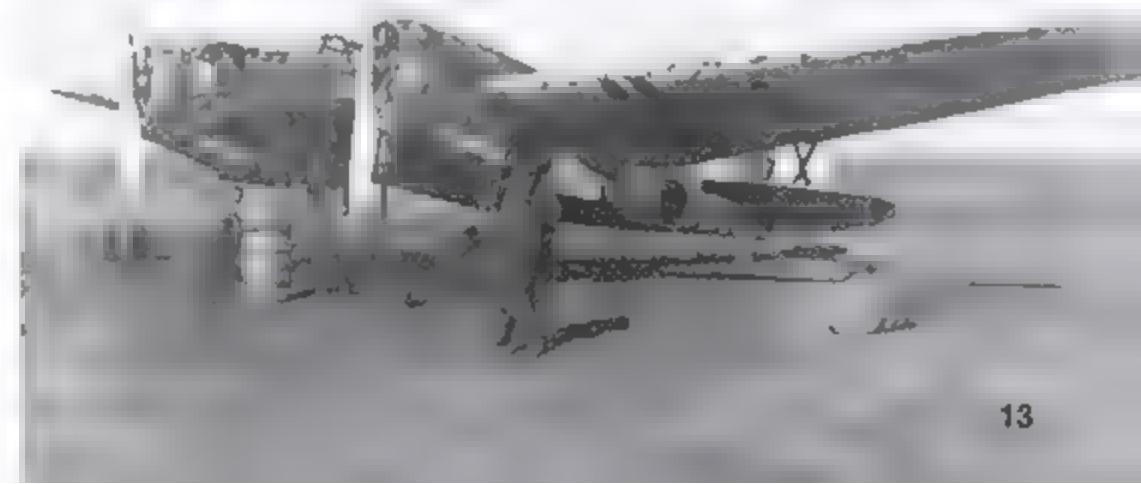


Rear Compartment  
Canopy (Opens Forward)

**SB-2-M-100-A  
(Modification in  
Spain)**



Rear Canopy Deleted;  
Fairing Added to Front of  
Compartment



Nationalist forces captured this SB-2-M-100-A during the Spanish Civil War. Black and white Nationalist markings were painted over the Republican markings. Upper surfaces had Green mottling over a Tan base, with Light Blue undersurfaces. (Museo del Aire)



Several Chinese SB-2-M-100-A's are parked at Hankow Air Base in early 1938. Soviet volunteer pilots flew these aircraft against Japanese forces. The near aircraft has a crudely painted yellow '5' painted ahead of the rudder on the vertical stabilizer (tailfin). Chinese aircraft had Dark Green upper surfaces and Light Blue undersurfaces. (San Diego Aerospace Museum via Ray Wagner)

A Japanese raid destroyed this SB-2-M-100-A on the ground. The stabilization bar between the vertical and horizontal rudder indicated that the aircraft was parked when the bombs fell. White Chinese tactical signs were painted on the tailfin. Blue and white rudder stripes were painted on many Chinese military aircraft during this period. (San Diego Aerospace Museum via Ray Wagner)



## SB-2-M-100-A in Chinese Service

Japan invaded China without a declaration of war on 7 July 1937. The Chinese Air Force began the Sino-Japanese War with only 284 combat aircraft. General Mao Pang-chu, who had learned to fly in the Soviet Union, commanded his force.

The Soviet Union and the Chinese Central Government signed a non-aggression pact on 21 August 1937. One of its secret clauses allowed the Soviets to send military aid to China. The emphasis of this aid was on rebuilding the Chinese Air Force, which had been virtually annihilated by the Japanese. The Chinese negotiated a major loan with the Soviet Union, who provided China with vital war materials in exchange for Chinese raw materials at low interest rates over five years.

Approximately 450 Soviet pilots and technicians assembled at Alma Ata (now Almaty) Kazakhstan during October of 1937. They accompanied the first 185 Soviet aircraft sent to China. This total included 115 fighters, 62 bombers, and eight advanced trainers. These aircraft and personnel went from Alma Ata to the end of the Chinese rail line at Lanchow, over the old Silk Road (the ancient trade route connecting China with western Asia).

China's SB-2-M-100-A's were built at GAZ (State Aircraft Factory) 125 *Imeni Stalina* at Irkutsk in Siberia. Soviet volunteer pilots collected the first batch from the factory and flew them from Irkutsk to Suchow, China, via Ulan Bator, Mongolia. After a sandstorm grounded the aircraft, the SBs flew from Suchow to Lanchow. Several Soviet pilots became trainee Chinese crews assigned to the 2nd Group on the SB-2-M-100-A. Captain LN Kozlov led the first combat mission in China on 2 December 1937, when he led nine SBs that attacked Japanese shipping in the East China Sea off occupied Shanghai.

Captain Feodor P. Polynin led the second group of 31 SB-2-M-100-A's. They were ferried from Irkutsk to Hankow, with stops at Alma Ata, Urumchi, Hami, and Lanchow. Soviet crews flew all combat missions until the Chinese were able to master these aircraft. The Soviet volunteers flew 150 missions against Japanese airfields, river traffic, and communications centers in January and February of 1938. One such mission was an attack by 13 SB-2-M-100-A's on the airfield at Nanking (now Nanjing) on 25 January 1938.

On 23 February 1938, Captain Polynin led 28 SB-2-M-100-A's against Hsin-chu airbase or the Japanese held Island of Formosa (now Taiwan). The bombers - each armed with ten bombs - flew most of the distance from Lanchow across the Formosa Strait at 5500' (18,045 feet). Lack of oxygen equipment caused many of them to suffer severe headaches. Despite this problem, the SBs approached Hsin-chu from the north and achieved complete surprise when they dropped their bombs. Japanese anti-aircraft fire was ineffective and no fighters rose to intercept the bombers. The SBs arrived at Lanchow without incident after a seven-hour mission. Madame Chiang Kai-shek, wife of the Chinese leader, rewarded the Soviet airmen with a banquet and decorations.

All of these missions were flown without fighter escort, however the SB-2-M-100-A was the fastest bomber on either side of the Sino-Japanese War. These bombers sustained relatively low losses during combat, while the greater threat came from Japanese raids on SB bases in China.

A third Soviet bomber group, led by Georgy I. Tkhon, left GAZ 125 at Irkutsk in late April of 1938. The SB-2-M-100-A's flew via Ulan Batur and Dulan Tzadagrad to Lanchow. This group also participated in several missions against the Japanese between June and October of 1938.

# Avia B-71

Czechoslovakia was a model democracy with a high standard of living between the two World Wars. In May of 1935, Czechoslovakia and the Soviet Union signed a non-aggression pact and a mutual economic agreement. In one section of the latter treaty, Czechoslovakia – one of the world's leading arms exporters – granted license production rights for its 75mm Skoda C-5 mountain gun and 75mm Skoda R-3 anti-aircraft gun to the Soviet Union. In exchange the Czechs received a license to produce the Tupolev SB for their air force.

A contract was signed between the Soviet external trade organization Technoexport and the Czechoslovak Ministry of National Defense on 15 April 1937. It called for the Soviets to deliver 61 SBs to Czechoslovakia. Avia – the aviation subsidiary of the world renowned car and tank manufacturer Skoda – would build another 161 aircraft under license at Kralupy. The Československé Letectvo (Czechoslovak Air Force) assigned the designation B-71 (Bitevý Bomber) to the SB. This aircraft was planned to serve in both bomber and long range reconnaissance units.

The Soviet built SBs delivered to Czechoslovakia were equipped with Czechoslovak built engines, armament, radios, and instruments. These components were shipped to GAZ 22 at Fili, where they were installed in the airframes. The unit price for these SBs was fixed at 118,400 US dollars.

Two 800hp Hispano-Suiza HS 12 Y-12 engines manufactured by ČKD Praga and Avia powered the B-71. The four 7.62mm ShKAS machine guns were replaced by three Czechoslovak 92mm ZB vz.30 machine guns.

The B-71 differed in several details from the standard SB-2-M-100-A. One vz.30 was mounted in the nose, instead of the Soviet aircraft's two ShKAS weapons. Two balance weights were mounted to the lower right wing. While Soviet SB-2-M-100-Ax lacked radios, the B-71s were radio-equipped. The Czechoslovak aircraft had a retractable antenna fitted in the right rear fuselage. Later Soviet SB-2-M-100-Ax equipped with V1Sh-24 free-floated propellers adopted the balance weights and radio antennas.

The Soviets delivered the first three B-71s (Serial numbers B-71-1 to B-71-3) in March of 1937. The initial B-71 was allocated to the *Výzkumný a Návštěvnický letecký ústav* (VZLÚ) (Aviation Institute) at Prague-Letňany for trials on 17 April 1937. This aircraft retained the SB's cartridge case ejection tunnel, which was not installed on subsequent B-71s. Additionally, the right nose step on the three pattern aircraft was mounted higher on standard B-71s. The first three B-71s had front and back sights on the vz.30 machine guns, these sights were not fitted on production aircraft.

The Soviets completed 61 B-71s, which were flown from Fili to Kiev, the Ukraine. Czechoslovak pilots flew the aircraft from Kiev via Romania to Košice, Czechoslovakia. There, the CL assigned the B-71s to their units. The CL allocated the first B-71 to an operational squadron on 13 March 1938. B-71 bombers were assigned to the 5. Letecí Pluk (LP) (Aviation Regiment) at Brno and the 6. LP at Prague. Reconnaissance tasked B-71s were allocated to the 1. LP at Prague and the 2. LP at Olomouc, Northern Moravia.

The German Wehrmacht invaded Czechoslovakia on 15 March 1939 – one year and two days after the B-71 entered CL service. The Germans formed the 'Reichspflichtkriegs Bohmen und Mähren' (Reich Protectorate of Bohemia and Moravia) from the Czech lands. Avia had not



B-71s had two balance weights under the right wing and a retractable radio antenna mounted under the fuselage. Neither feature was found on contemporary SB-2-M-100-Ax. This early B-71 lacked nose armament and had a lower placed step on the left nose than on standard B-71s. Soviet workers incorrectly painted the Czechoslovak national insignia on the rudder. (Igor Mrkvanek)

The first B-71 carried a cartridge case ejection tunnel which was deleted on subsequent aircraft. The 7.92mm ZB vz.30 machine gun & front ring and back post sights were also absent on standard B-71s. (Igor Mrkvanek)





Armament was not installed on this B-71 (3K). This red fuselage code indicated assignment to the 72. Letka (Squadron), 8. Letecky Pluk (LP Aviation Regiment) at Prague. The opened main landing gear doors obscure the Regiment's insignia immediately forward of 3K. Avia B-71s were delivered in overall Light Gray (approximately FS36595). (Igor Mrkvíček)



The lower 7.92mm vz.30 machine gun is fully extended on this early production B-71 (S18). This aircraft was assigned to the VZLU (Aviation Institute) at Prague-Letnany. Fuselage codes were red, while the national insignia was blue (facing forward), white, and red with a red border. (Igor Mrkvíček)

began license manufacture of the B-71 at that date, therefore, all 59 B-71s that fell into German hands were all from Soviet production



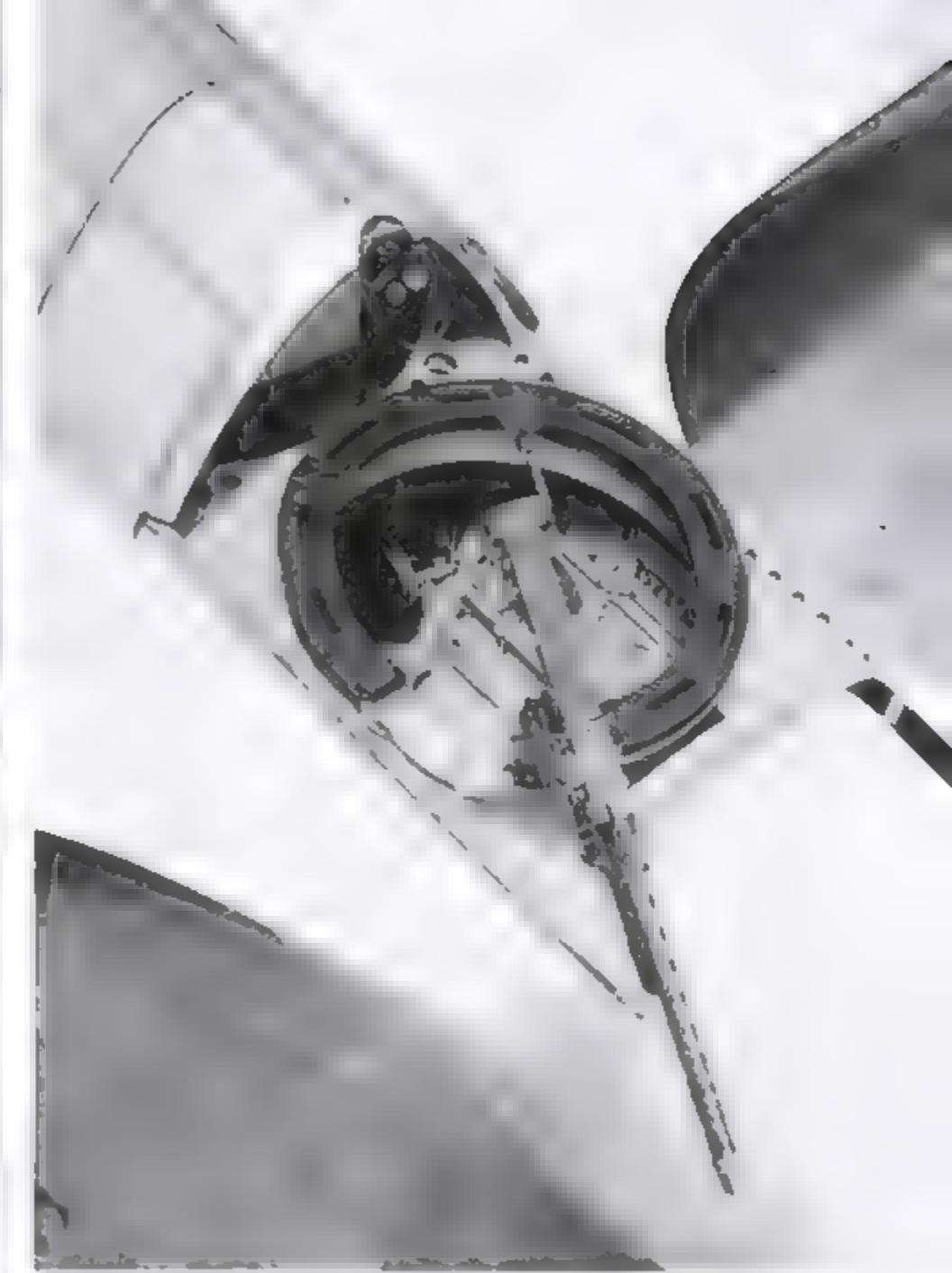
The same B-71 (S18) suffered a landing gear malfunction and made a belly landing at Prague-Letnany. Slightly bent propellers indicated the B-71's engines had shut down prior to this forced landing. Many Czechoslovak B-71s had natural metal finishes, although others were camouflaged during the Fall of 1938. (Bohumír Kudlíčka)



(Above) Various controls and gauges were mounted on the right side of the B-71's right nose compartment. These include the bomb bay door and bomb release controls on the lower portion of this area. The navigator/bombardier occupied this section of the aircraft. SB and B-71 crew interior surfaces are believed to have been painted Interior Gray (approximately FS24226).



(Right) The B-71 had one nose-mounted machine gun, instead of the two guns fitted to standard SBs. This weapon was elevated or depressed through the glazing's slot, but could not be traversed to either left or right. A venturi tube is mounted on the lower left nose, immediately above the left half of the two lower nose hatches.



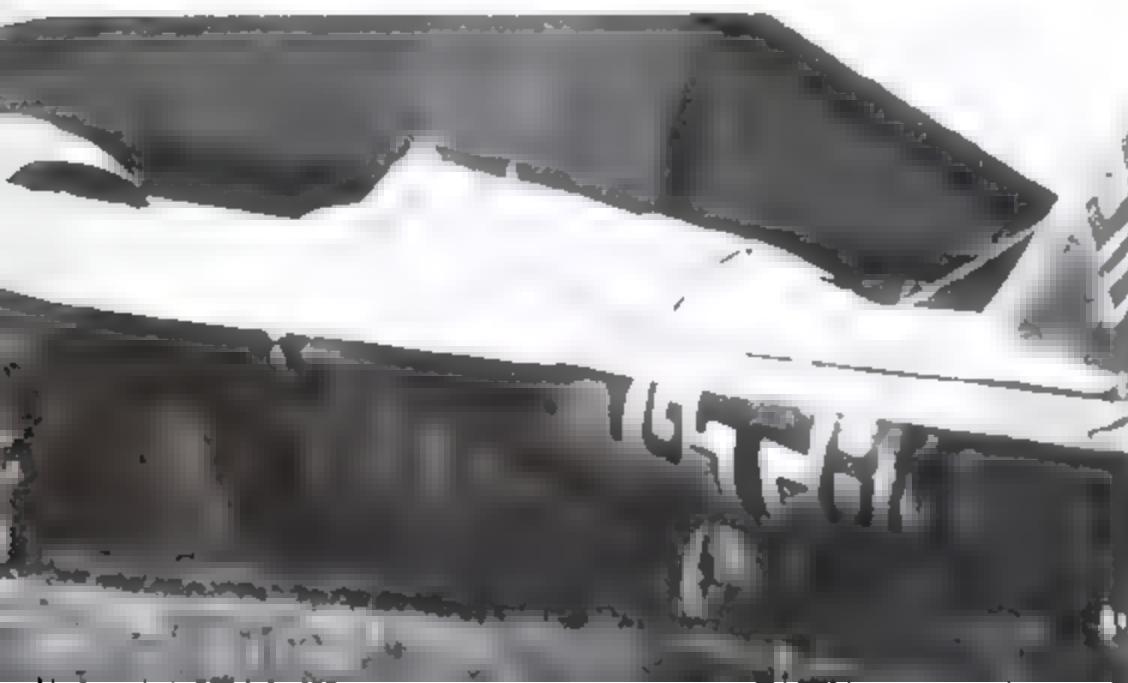
One 7.92mm vz.30 machine gun is mounted in the B-71's TUR-9 dorsal mount. This was the same mount used on most SBs, except for substitution by the 7.62mm ShKAS. A rectangular slot immediately aft of this compartment allowed the weapon to be stowed when not in use. The 9.6 kg (21.2 pound) ZB vz.30 had a muzzle velocity of approximately 762 m (2500 feet) per second and a cyclic firing rate of 500 rounds per minute. By comparison, the 10.6 kg (23.4 pound) ShKAS' muzzle velocity was 825 m (2707 feet) per second and its cyclic firing rate was 1800 rounds per minute.

# Avia B-71 in German Service



The Luftwaffe commandeered this Soviet-built B-71 (B.71-9) after the German occupation of Czechoslovakia in March of 1939. The Germans deleted the circular rear window after seizing this aircraft. German markings were applied over the original Czechoslovak camouflage of Brown, Green, and Light Green Gray upper surfaces and Light Gray undersurfaces. Narrow *Balkenkreuze* (Beam Crosses) were standard between April of 1939 and the Summer of 1940. The red 9 on the vertical tail has a narrow white outline. (Zdenek Hurní)

Aero built this B-71A (tail fin VG+BN/123) at Praha (Prague)-Vysocany on 15 July 1940. It was assigned to *Luftdienst-Kommando* (Air Service Command) 1/68. The aircraft crashed on 10 September 1940. (Manfred Glehn)



The Slovak portion of Czechoslovakia became an independent state after German forces occupied Czechoslovakia on 15 March 1939. The Germans seized 59 serviceable B-71s – all from Soviet production – on various Czechoslovak airfields.

The Luftwaffe originally painted a narrow *Balkenkreuz* (Beam Cross) national insignia over the Czechoslovak markings and a small *Flakentkreuz* (Flak Cross, or swastika) on the rudder. The aircraft retained their original color schemes of either overall Light Gray (approximately FS36595) or a three tone upper surface camouflage. This latter scheme consisted of Brown (approx. FS34045), Green (approx. FS34092), and Light Green Gray (approx. FS34504), with Light Gray undersurfaces.

The Germans deleted a circular window on both rear fuselage sides on the Soviet-built B-71s. Some aircraft had their armament removed.

The Luftwaffe flew most of the seized B-71s from their Czechoslovak bases to Meseburg, Germany for storage. Some Czechoslovak pilots assisted the Germans in carrying out these ferry flights. Bohuslav Skramid and Josef Navesinsk flew their B-71s from Hradec Králové on 26 April 1939; however, they did not fly to Meseburg, but instead defected to the Soviet Union.

The Germans allocated one B-71 (Serial Number B.71-2) to the Luftwaffe's Test and Evaluation Center at Rechlin in April of 1939. It was employed for engine and flight tests until late June of that year.

The *Vazdušni vojski* (VV, Royal Bulgarian Air Force) purchased 32 B-71s from Germany in September of 1939. They received German civil registrations for the ferry flight to Bulgaria. The *Vojenské letectvo* (VL, Slovak Air Arms) received three B-71s from German storage.

# Avia B-71A in German Service

Avia's license production of the SB 2 M 100-A was in the advanced planning stage at the time of Germany's occupation of Czechoslovakia on 15 March 1939. The Germans found the B-71 license valid for the type, so they ordered 76 B-71As from Avia and Aero.

The Avia factory at Čáslavice assembled 41 B-71As (Serial Numbers 152 to 191 and 193), with the first example making its maiden flight on 21 July 1939. It was subsequently delivered to the *Erprobungsstelle* (Test Center) at Iarmowitz the following September. The last Avia-built B-71A (191/Stammkennzeichen: SE+EY) left the assembly line on 27 August 1940.

The Aero plant at Prague-Vysocany built 35 B-71As, which were assigned the serial numbers 117 to 151. The first Aero-built B-71A (143/1B+PI) left the assembly line on 22 May 1940 and was assigned to *Luftdienst Kommando* (Air Service Command) 1/7 at Lechfeld airfield in Bavaria.

The first Avia B-71A had several differences from the Soviet-built B-71. All armament was deleted on the B-71A and a metal sheet covered the center section of the nose glazing. The V-shaped step below the emergency roof hatch on the right was removed. A fixed radio antenna atop the fuselage and aft of the cockpit replaced the retractable antenna on the lower right fuselage. A rear view mirror was mounted atop the cockpit canopy frame. Most B-71As del-

ed the circular window were both rear fuselage sides. A crew entry step was installed on the left fuselage aft of the rear wing. A fairing for part of the target towing equipment replaced the lower fuselage gun position. This equipment consisted of a winch, a drum with the 2.5mm diameter cable, and a 3 m (9 feet 10.1 inches) long canvas target sleeve. The winch varied in length between 6 m (19 feet 8.2 inches) and 9 m (29 feet 6.3 inches). The target-towing device occupied the former bomb bay and lower gun station. Installation of this equipment shifted the aircraft's center of gravity. This was compensated for by adding 240 kg (529 pounds) of ballast to the navigator's compartment in the nose.

Both Avia and Aero painted the B-71As in the standard Luftwaffe camouflage scheme. This consisted of upper surfaces in RLM 70 Black Green (approximately FS34050) and RLM 71 Dark Green (approx. FS34079), with undersurfaces in RLM 65 Light Blue (approx. FS35352). Most B-71As had the *Stammkennzeichen* applied in RLM 22 Black (approx. FS37038) on the rear fuselage and wing undersurfaces. Between 1939 and the Summer of 1940, small *Balkenkreuze* national insignia were painted on the fuselage, upper wings, and lower wings. Larger *Balkenkreuze* were used from mid 1940, while the *Hakenkreuz* was moved from the rudder to the entire vertical tail.

The Luftwaffe assigned most B-71As to *Luftdienst Kommando 6* (Air Service Command 6). These aircraft were employed for target towing and for meteorological flights. Other B-71As were flown by *Ausbildungsgruppe 104* (Training Group 104), *Jagdfliegerakademie* (Fighter Pilot Training Unit 4), and the secret bomber wing *Kampfgeschwader 200* (KG 200). The B-71A's well-built all-metal structure and good performance ensured a long career in flyable service. The Luftwaffe had 57 B-71As in service by 31 March 1941; however, spare parts shortages reduced this total to nine aircraft by 30 September 1944.

## Avia B-71

No Rear View Mirror   No Antenna Mast



7.92mm v20 Machine Gun

## Avia B-71A

Rear View Mirror   Antenna Mast



Machine Gun Deleted



This Avia-built B-71A made a 'wheels up' landing on a meadow near Letnáry on 27 May 1940. The *Stammkennzeichen* (Root Markings) normally found on the fuselage were only painted on the lower wing surfaces. The antenna mast atop the fuselage and the lack of the circular rear window are typical for a Czechoslovak-built B-71A. (Zdenek Hurt)

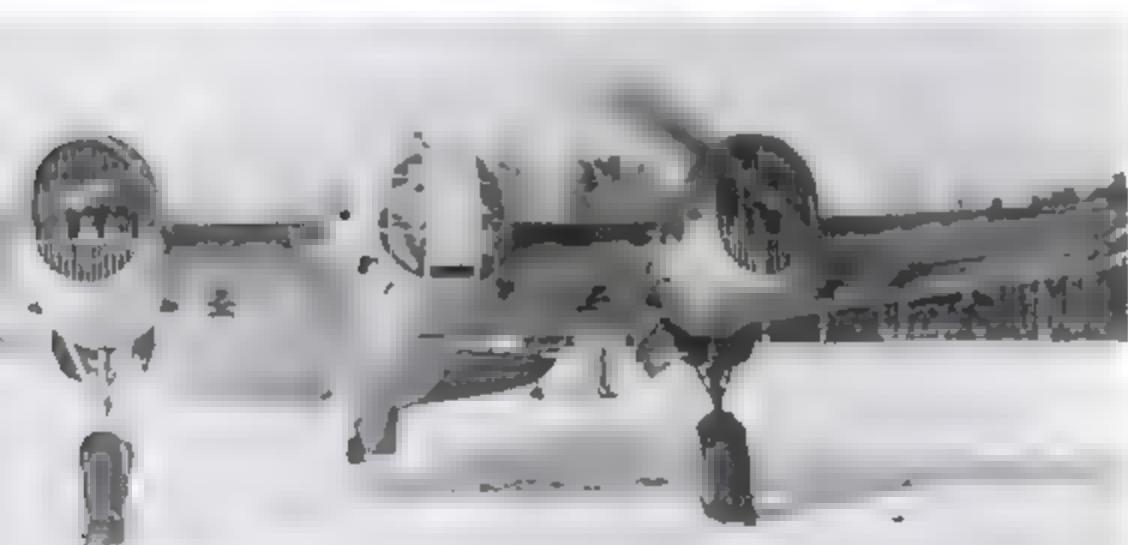
A B-71A (SE+ED/170) is parked at Celle, Germany in 1941. It was completed at Avia's Cakovice assembly line on 26 April 1940. This B-71A was assigned as a target tug with *Luftdienst Kommando 2/11*. (Karl Kössler)





An Avia B-71B (SE+FJ/202, foreground) and an Avia B-71A (SE+EF/172) warm up their engines at Cetle in early 1941. Both aircraft were assigned to *Luftdienst Kommando 2/11* at the German airbase. An unknown unit insignia is painted on the B-71B's nose. The B-71B had a different towing winch fairing and position from the earlier B-71A. Undersurfaces were painted RLM 04 Yellow (FS35358). (Karl Kösster)

The same B-71B (SE+FJ/202) warms up its engines prior to a mission in early 1941. This aircraft crash-landed due to an engine failure on 6 March 1941. Protective material was placed over the nose glazing a slot while the lower front fuselage side windows were removed. Six pylons were mounted under the wings – three each to left and right. The T-shaped antenna atop the fuselage was typical for Avia B-71Bs. (Karl Kösster)



## Avia B-71B in German Service

The B-71B was an improved B-71A that appeared in 1940. The target towing cable was lengthened to 1000 m (3281 feet). The cable-operator's rear fuselage station was moved forward to allow for the additional space needed by this improved target towing device. This device's weight increased from 210 kg (463 pounds) on the B-71A to 280 kg (617 pounds) on the B-71B. Additionally, the cockpit canopy was moved forward.

The B-71B differed in a number of details from the earlier B-71A. Two triangular shaped windows aft of the nose glazing were deleted, while a T-shaped boom was added atop the antenna mast. A step was fitted atop the port wing rear extension and a holding boom was mounted behind the rear canopy. The bomb bay doors were deleted and the nose compartment exit hatch relocated aft. Some late production B-71Bs were fitted with a windshield in front of the rear alt-sliding canopy. The winch housing was repositioned forward and the two stabilization booms on the housing's rear were deleted. Also removed were the oval rear fuselage windows. Three pylons were installed on the undersurface of each wing.

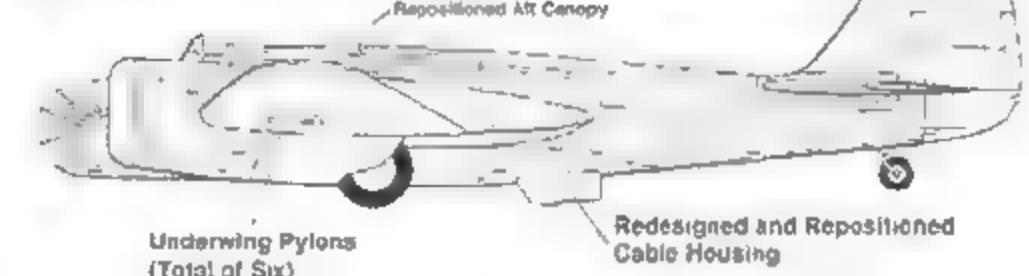
Aero and Avia combined to build 35 B-71Bs. Aero manufactured ten B-71Bs (serial numbers 107 to 116) at its Prague Vysocany plant. The first B-71B (107/Stampenkennzeichen, 110+FA) left the assembling hall on 18 October 1940. It was assigned to the Luftwaffe's Test and Evaluation Center at Rechlin. The Luftwaffe accepted the last Aero-built B-71B on 26 November 1940.

The Avia factory at Cakovice supplied 25 B-71Bs (192 and 194 to 217) to the Luftwaffe. The last aircraft (217/SL+FY) was completed on 30 April 1941. Between July of 1939 and April of 1941, Avia and Aero built 111 B-71As and B-71Bs for the German Luftwaffe.

### Avia B-71A



### Avia B-71B



# Avia B-71 in Bulgarian Service

Bulgaria purchased 32 B-71s from Germany in September of 1939. These aircraft were built at GAZ 22 at Fihr Soviet Union and were delivered to the ČL (Czechoslovak Air Force) prior to Germany's invasion of Czechoslovakia in March of 1939.

The Germans handed over the Avia B-71s to the *Vozdušnou Vojsko* (VV - Royal Bulgarian Air Force) at Merseburg, Germany. These aircraft were assigned to the 5th Bomber Polk (BP - Bomber Regiment) at Plovdiv. Bulgarian pilots nicknamed the B-71 the *Zherav* (Crane).

VV B-71s first saw combat in late September and early October of 1941, when Greeks in Thessaly revolted against Bulgarian rule.<sup>1</sup> Three B-71s took off from Plovdiv and bombed the rebel-held town of Drama in Macedonia. This was the 5th BP's sole combat mission while Bulgaria was allied with Germany.

The Soviet Union declared war on Bulgaria - which had remained neutral in the Axis war against the Soviet Union - on 5 September 1944 and the Red Army invaded three days later. The pro-Soviet Democratic Party of the Patriotic Front, led by Kamen Georgiev, seized power and declared war on Germany on 9 September.

The 5th BP's 2nd Yoto (Squadron) had 21 B-71s on strength in November of 1944. On 14 November, these B-71s redeployed from Plovdiv to Vratza/etna, from where they flew bombing missions against the retreating Wehrmacht. The VV's B-71s were not directed to specific targets, but attacked targets of opportunity in allocated areas where the Bulgarians believed German troops were concentrated.

Three B-71s attacked a German train at the Vuch-train railroad station in Yugoslavia on 18 November 1944. This raid caused heavy fire damage to this train. Four B-71s bombed the Zhitance rail station the next day. The bombers encountered heavy anti-aircraft fire over the target and returned safely to Vratza/etna.

Several B-71s flew a 'free hunting' mission against targets - predominantly in the regions of Mirovica and Rashka on 20 November. These aircraft attacked a train north of Mirovica at 12:30 hours. *Zherav* 4 had a bomb bay door malfunction during its bomb run, which prevented it from releasing its bombs. Sergeant Manol Dojchev became disoriented while flying *Zherav* 11 and force-landed the bomber at Stara Zhelezare, near Plovdiv.

The forth and final VV B-71 mission was flown the next day. Four B-71s joined a formation of approximately 15 Lockheed P-38 Lightning fighters of the US 15th Air Force. The Bulgarian bombers bombed a motorized column near Kamenska, while the Americans attacked a railroad station near Mirovica. This was the only joint Bulgarian-US attack against German forces during World War Two. *Zherav* 4 lost its bearings after the attack and made a forced landing at Stara Zhelezare.

The front moved beyond the B-71's range after this attack. The VV B-71s conducted 14 sorties during these four missions, in which they destroyed two railroad stations, three trains, and one German motorized column. No Bulgarian airmen were injured during these missions.



The right main landing gear collapsed on this B-71 of the 5th Bombardirovoches Polk (BP, Bomber Regiment), *Vozdušni Vojski* (VV - Royal Bulgarian Air Force) at Plovdiv. Bulgarian markings were painted on the original Czechoslovak camouflage. National insignia on the fuselage and wings consisted of a black diagonal cross on a black-trimmed white square. The rudder was striped (from top) white, green, and red (Stephan Boshniakov).

Ground crewmen service a 5th BP B-71 at Plovdiv. The Regiment's emblem - a devil riding on a bomb - was painted on the nose. This insignia's colors are unknown. (Stephan Boshniakov)



<sup>1</sup>Bulgaria invaded the Greek provinces of Thessaly and Macedonia and the Yugoslav province of Macedonia, known as the Republic of Macedonia at the time.

<sup>2</sup>See the table on page 10 for the aircraft's performance figures.

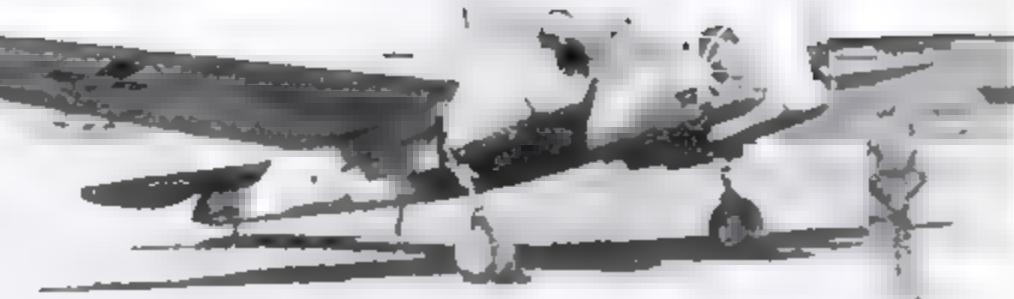
## B-71 in Slovak Service

On 15 March 1939, Czechoslovakia was split into a 'Reich Protektorat of Bohemia and Moravia' that was absorbed into the Third Reich and the independent State of Slovakia. Three Avia B-71s were among the nearly 100 aircraft in the inventory of the newly formed *Vzdušné zbrane* (Vz, Slovak Air Arm), which was commanded by Lieutenant Colonel Ján Ambros. One of these B-71s (B-71-19) suffered a forced landing in the Slovakian part of Czechoslovakia in early 1938. It was still under repair when the Germans divided Czechoslovakia.

Hungarian troops occupied Ruthenia ('Sub-Carpathian' Ukraine) at the same time and sought territory in southern Slovakia. This soon led to several border clashes between Hungary and Slovakia, which included some air battles. On 24 March, ten *Magyar Királyi Honvéd Légierő* (MKHL, Royal Hungarian Air Force) Junkers Ju 86K-2 bombers attacked Spišská Nová Ves airfield. This raid damaged one of the Slovak B-71s parked at this base.

The B-71 (B-71-19) damaged in early 1938 was repaired in the spring of 1939. It was then assigned the Vz registration 'Blue V3.' This bomber was fitted with German radio equipment. A Direction Finding (DF) loop antenna and an antenna mast were mounted on the upper fuselage behind the cockpit. Two rack antennas were fitted to the lower rear fuselage. The original retractable antenna was retained on the lower fuselage. The Slovaks removed both balance weights from the lower right wing.

Five Slovak airmen escaped from Slovakia to neutral Turkey in B-71-19 on 18 April 1941. Sergeant Anton Vanko took off from Trenčianské Biskupice airbase near Trenčín in Western Slovakia. Aboard were Privates First Class J. Končan, J. Deoch, L. Štezák and L. Pollák. The B-71 flew from Trenčín to Biskupice to Kesteltepe, Turkey, where Turkish authorities briefly interned the crew. The five Slovaks then traveled via North Africa to England, where they joined the Czech-Slovak Air Force fighting alongside the Allies. Vanko became a Supermarine Spitfire fighter pilot with No. 312 (Czecho-Slovak) Squadron, Royal Air Force at Bradwell Bay, England. He was killed in a take off accident on 8 December 1941.

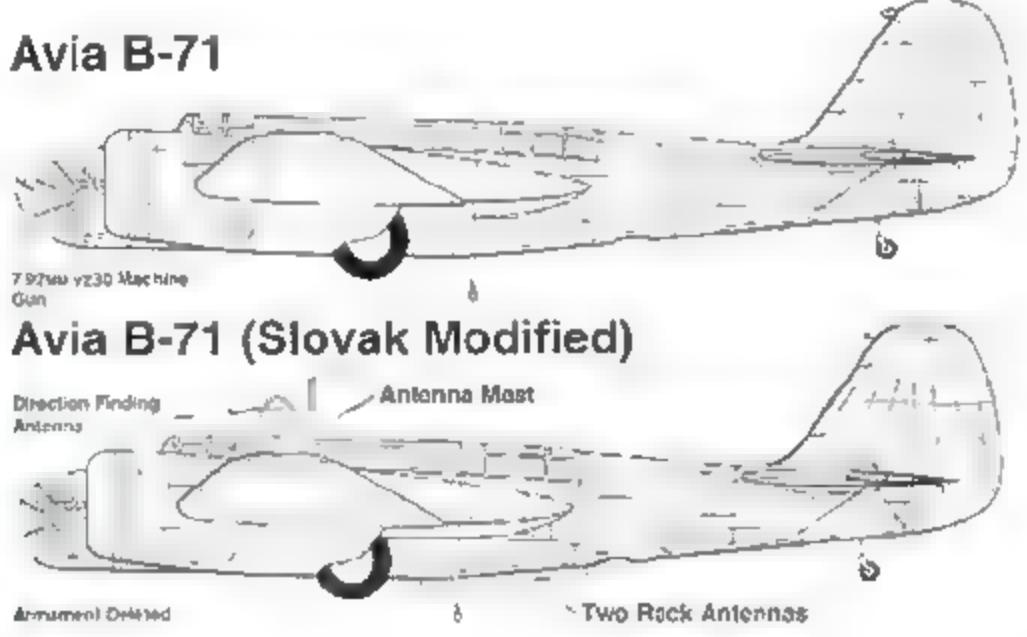


This *Vzdušné zbrane* (Vz, Slovak Air Arm) B-71 (B-71-19) was fitted with a direction finding antenna behind the canopy and another antenna atop the fuselage. A rack antenna was mounted under the rear fuselage. Nose armament and both lower right wing balance weights were removed. A group of five Slovaks defected with this B-71 to neutral Turkey on 18 April 1941. (Zdenek Hurt)

A Vz B-71 sustained a landing gear failure and made a crash landing in a meadow. The slight rearward bend of the propeller blades indicated a lack of power when the B-71 made this forced landing. The Slovak national insignia - a white-trimmed blue *Balkenkreuz* with a red disc at the cross' center - was painted on the rudder. (Stanislav Spurný via Bohumír Kudlčík)



### Avia B-71



# Tupolev SB-2-M-100-A (Modified)

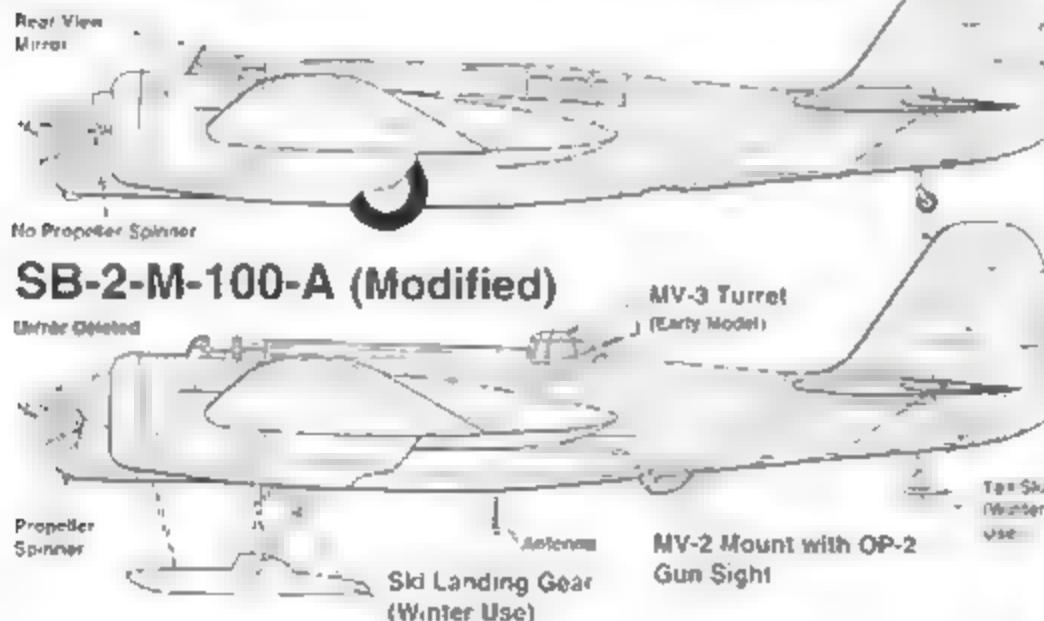
In late 1936, Tupolev developed a modified version of the SB-2-M-100 based on early combat experience in the Spanish Civil War. These missions demonstrated that its speed was superior to any other contemporary fighter or bomber in Spain, but several shortcomings were detected in the *K-attack*.

One of these shortcomings was the limited angle of fire in both the rear upper and lower rear positions. Pilots also complained about the lack of self sealing fuel tanks and the absence of an intercom system for the three-man crew. The pilot could not warn his rear gunner about an attack. The navigator-bombardier used a light signaling code to tell them if the aircraft was either on a proper bomb run or was off to the left or right. Lack of radio equipment made communications within a formation or with home base impossible. Combat experience clearly showed that radio communication was essential for successful bombing missions.

A single prototype designated SB-2-M-100-A (Modified) was built in early 1937. This machine incorporated several modifications intended to address the shortcomings identified over Spain. An MV-3 turret used on the Illyushin DB-3 bomber replaced the TLR-9 manually operated upper machine gun mount and the front sliding rear canopy. This turret was armed with one 7.62mm ShKAS machine gun. An MV-2 turret with a 12.7mm ShKAS and 1500 rounds of ammunition replaced the lower rear gun position. The MV-2 turret was equipped with an OP-2 telescopic sight and offered a much improved angle of fire against targets in the lower rear position. The first MV-2 turret variant installed on the SB-2-M-100-A (Modified) had a solid cover, while the subsequent version was equipped with a glazed cover. This aircraft also received a Type 13 SK-3 radio set. A retractable antenna was installed on the left lower fuselage.

The standard SB-2-M-100-A's twin engines each turned a two-bladed V-100 propeller which had a diameter of 3.4 m (11 feet 1 9 inches). Three-bladed VIM-2 metal propellers measuring 3.3 m (10 feet 10 inches) in diameter were installed on the SB-2-M-100-A (Modified). The VIM-2 was a variable pitch propeller copied from an American Hamilton-Standard propeller. This propeller had a spinner over its hub, which was not found on the V-100.

## SB-2-M-100-A



The ski-equipped SB-2-M-100-A (Modified) sits on the snow-covered ramp at Kratovo between test flights in early 1937. The aircraft is in its original configuration, with a solid covered lower MV-2 turret. (Viktor Kulikov)

Two balance weights were added to the SB-2-M-100-A (Modified) right wing undersurfaces. This aircraft lacked the rear view mirror installed on most SB-2-M-100-A's. Gross weight increased from the SB-2-M-100-A's 5732 kg (12,637 pounds) to 5810 kg (12,809 pounds) on the SB-2-M-100-A (Modified).

Factory tests began in early 1937, during which the SB-2-M-100-A (Modified) was fitted with a ski undercarriage for flying off snow-covered airfields. A conventional landing gear replaced the skis when the aircraft performed State Acceptance Trials between May and June of 1937. During these tests, the SB-2-M-100-A (Modified) reached a speed of 347 kmh (216 mph) at ground level and 412 kmh (256 mph) at 4000 m (13,123 feet). The latter speed was approximately 11 kmh (6.8 mph) slower than for standard production SB-2-M-100-A's. The SB-2-M-100-A (Modified) was recommended for mass production, but this never occurred and only 100 were built. The sole aircraft of this variant, Several components – notably the radio equipment and the MV-3 turret – were progressively introduced to subsequent SBs, although with a considerable delay caused by unknown production difficulties.

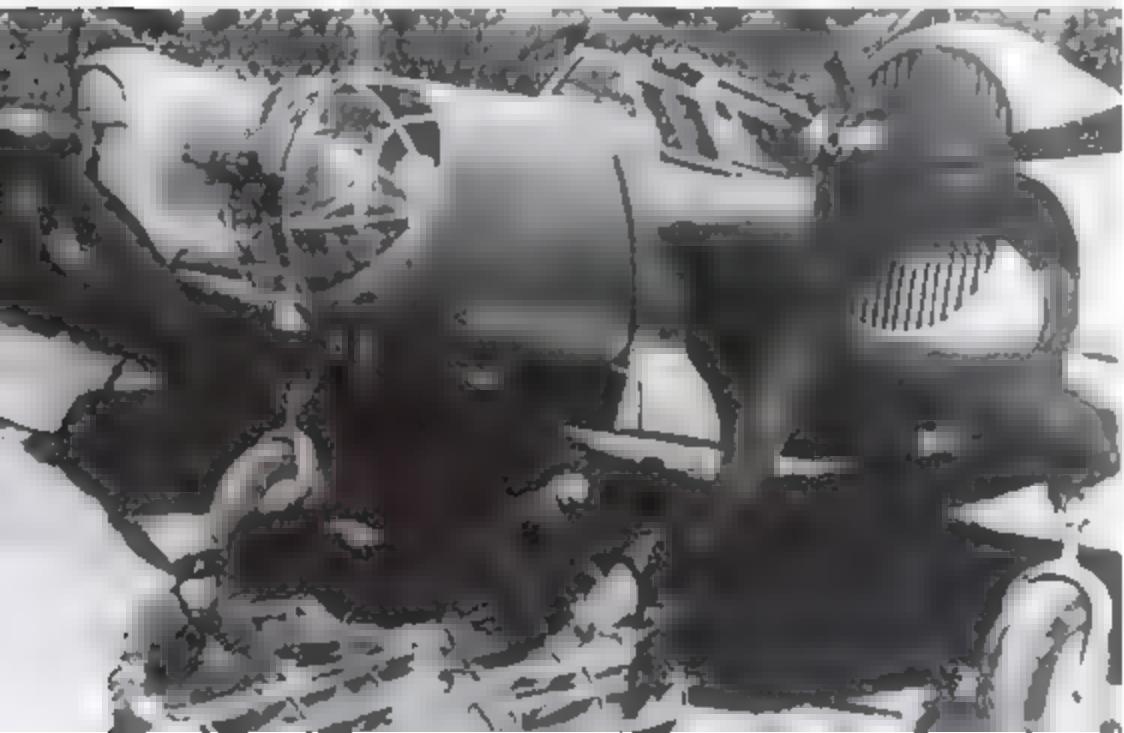
A glazed MV-2 ventral turret was retrofitted to the SB-2-M-100-A (Modified) in May of 1937. Clear panels over this turret improved visibility for the gunner in aiming and firing the weapon. The undercarriage skis employed for winter flying were removed. (Viktor Kulikov)





An early SB-2-M-100-A (Three-Blade Propeller) (Red 4) is parked on the ramp at a VVS (Soviet Air Force) base. Most SBs built prior to World War Two were left in a natural metal finish. The tactical number is painted on the rudder, while the upper vertical stabilizer and rudder is red. National markings – red stars with thin black trim – are placed on the upper wing surfaces and aft fuselage sides. These markings were also painted on the wing undersurfaces. (Viktor Kulikov)

Ground crewmen load 100 kg (220-pound) FAB-100 bombs onto an early SB-2-M-100-A (Three-Blade Propeller). This aircraft has the venturi tube mounted on the lower left nose and lacks a rectangular nose window. Both were characteristic of early production SB-2-M-100-As. (RART)



## SB-2-M-100-A (Three-Blade Propeller)

Three-bladed VISH 2 propellers replaced the two-bladed V-100 propellers on SB-2-M-100-As produced at Irkutsk in late 1937. All three propeller blades were hydraulically adjusted in a 10° pitch range. The newer propeller considerably improved the SB-2-M-100-A's performance. Its ceiling was 1160 m (3806 feet) higher, the take off run was shortened by approximately 150 m (492 feet), and climbing performance was improved. The sole shortcoming was the 4 kmh (2.5 mph) maximum speed reduction. Two balance weights were mounted on the right wing undersurface. Installation of the VISH 2 propellers did not result in a change to the SB-2-M-100-A designation.

Several modifications were progressively introduced during production of the SB-2-M-100-A (Three-Blade Propeller). It was originally equipped with six DER-34 bomb racks in the bomb bay. These racks carried six 100 kg (220-pound) FAB-100 general-purpose bombs horizontally with two more FAB-100s vertically stowed in the bay's rear for a total 800 kg (1764-pound) load. Two DMR-23 racks for horizontal carriage of two 250 kg (551-pound) FAB-250 bombs replaced the six DER-34 racks. An ESBK-2 electrical bomb release system was installed, with an ASBR-3 mechanical release system employed if the ESBK-2 malfunctioned or in an emergency.

Late production SB-2-M-100-As were equipped with two DER-9 pylons on the wing undersurfaces, between the fuselage and the engine nacelles. Each pylon carried bombs weighing up to 500 kg (1102 pounds). A PMP-6 gun sight replaced the TUR-9 rear upper gun mount's PMP-3 sight on late production aircraft.

Type 13 SK-3 radio's were installed in early SB-2-M-100-As with three-bladed propellers, however most aircraft received either the RSR or RSB-Dvina radio sets. An SFT-3 intercept system was also installed. Late production SB-2-M-100-As received the RSB-6k radio, which employed an antenna mast atop the cockpit canopy. The rear view mirror was deleted when this antenna was fitted. Some SB-2-M-100-As had the mast placed on the left rear view mirror, and mostly hung inverted to the left. A few SB-2-M-100-As had it on the upper fuselage between the cockpit and the rear gunner's compartment.

Cold air at high altitude entered the two large machine gun clearance slots in the nose glazing. This caused great discomfort for the navigator/bomber/driver. This condition was corrected by installing movable Plexiglas sheets above and below the 7.62mm ShKAS barrels in the SB-2-M-100-A. These sheets were located in rails placed in the upper and lower nose sections and kept the cold air out of the nose compartment. Installation of these sheets necessitated removing the lower rectangular window and the cartridge case ejection tunnel cover and shortening the ejection tunnel. This window was eliminated in many SB-2-M-100-As.

Early SB-2-M-100-As had a venturi tube mounted on the left front fuselage. This feature was retained from the earlier SB-2-M-100-As with two-bladed propellers, but was deleted on most later SB-2-M-100-As. Early aircraft had one venturi tube on the right side of the nose. On late production SB-2-M-100-As deleted the larger tube mounted high on that side.

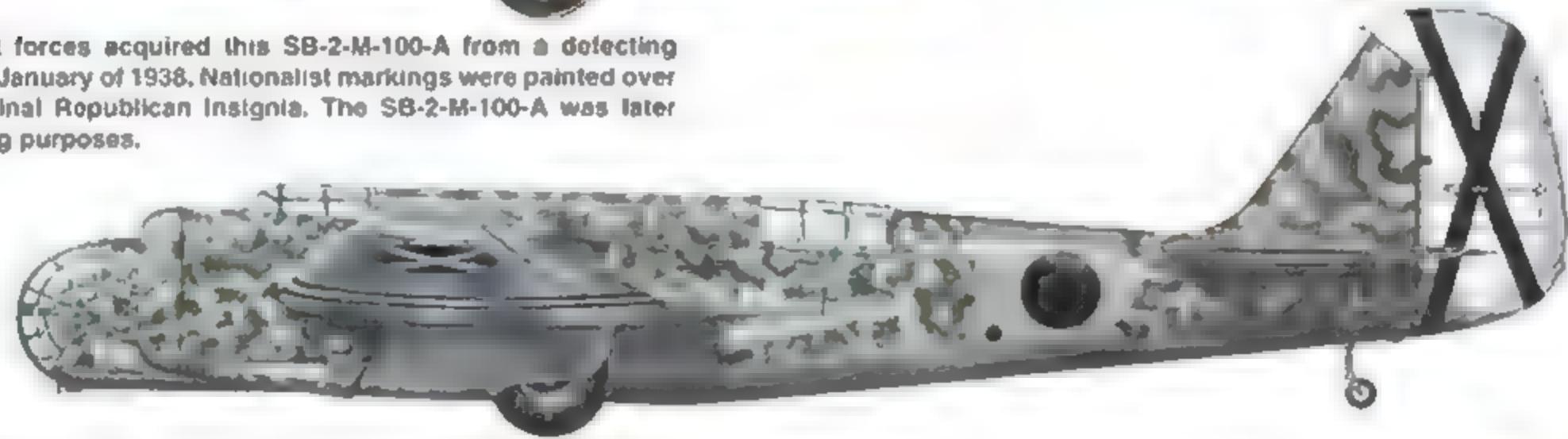
Several aircraft were equipped with the RPK-2 radio compass and Direction Finding (DF) receiver, which was copied from the American Bendix device. A scope was mounted for the navigator/bomber/driver's use in the left side of the nose compartment, but not all aircraft had the antenna mounted on the lower nose. The RPK-2 was primarily employed as a navigation aid on night missions.

A landing light was mounted in the left wing's leading edge on most SB-2-M-100-A aircraft.

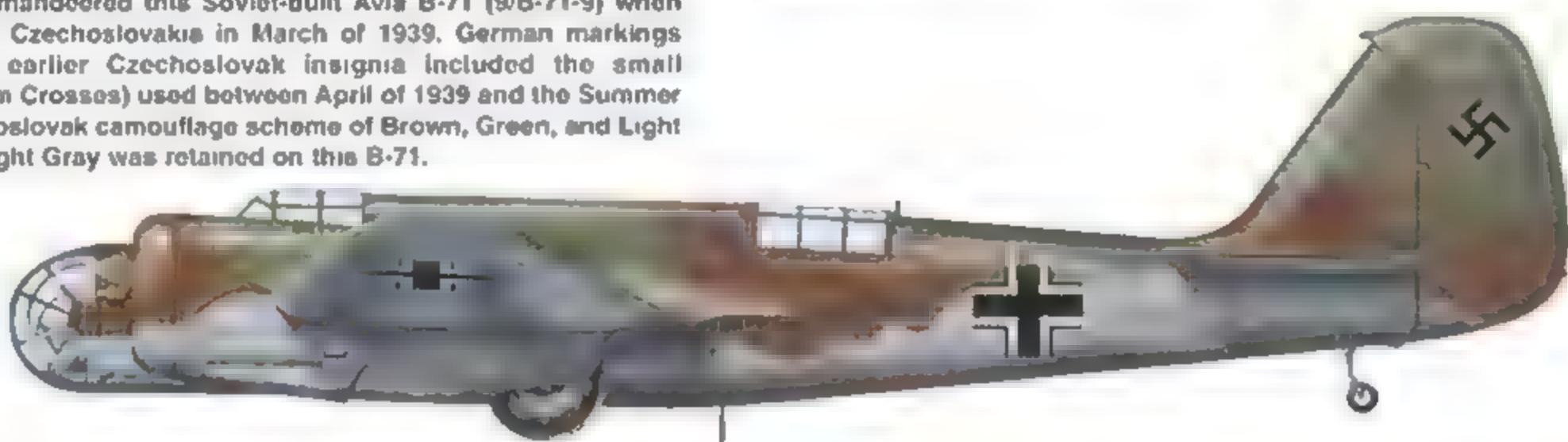
This Tupolev SB-2-M-100-A (White 46/BK-069) was assigned to Grupo (Group) 24, Republican Air Force in Spain in 1936-37. The Katuska was retrofitted with a fairing immediately forward of the radio operator/gunner's dorsal position. It was camouflaged in Dark Green and Light Brown upper surfaces and Light Blue undersurfaces.



Spanish Nationalist forces acquired this SB-2-M-100-A from a defecting Republican crew in January of 1938. Nationalist markings were painted over the Katuska's original Republican Insignia. The SB-2-M-100-A was later employed for testing purposes.



The Luftwaffe commandeered this Soviet-built Avia B-71 (9/B-71-9) when Germany occupied Czechoslovakia in March of 1939. German markings painted over the earlier Czechoslovak insignia included the small *Basikenkreuze* (Beam Crosses) used between April of 1939 and the Summer of 1940. The Czechoslovak camouflage scheme of Brown, Green, and Light Green Gray over Light Gray was retained on this B-71.



This Avia B-71 (V3/B-71-19) was assigned to the *Vzdušne zbrane* (Vz; Slovak Air Arm) in 1939. Additional antennas mounted on the upper and lower fuselage were for German radio equipment installed on the aircraft. Sergeant Anton Vanko and four colleagues defected to Turkey in this B-71 on 18 April 1943.



A ski undercarriage was installed on this Soviet SB-2-M-100-A (Blue 8) for winter operations. The natural metal aircraft saw action against Finland during the Winter War of 1939-40.



Soviet crews hand-painted green patches over the upper surfaces of this natural metal SB-2-M-100-A (Red 4) in mid-1941. German fighters damaged this bomber soon after it took off on 22 June 1941, when German forces invaded the Soviet Union. The SB-2-M-100-A made a 'wheels up' landing after the aerial battle.



Advancing German troops captured this late production SB-2-M-100-A (Red 0) in the Summer of 1941. It is camouflaged in Medium Green upper surfaces and Light Blue undersurfaces. The VVS rarely allocated the tactical number 0 (Zero) to a bomber.



This VVS late production SB-2-M-100-A (White 9) operated against Axis forces in the Winter of 1942. The white temporary camouflage paint has mostly obscured the tactical number on the tail. Its crew removed the rear canopy for improved dorsal machine gun field of fire.



The Chinese Air Force flew this early SB-2-M-103 (Black 36) from 1939. It was deployed against invading Japanese forces during the Sino-Japanese War. Blue portions of the Chinese national insignia are painted directly onto the natural metal finish, without the usual white portions.



This late production SB-2-M-103 (White 2) was assigned to a VVS Bomber Aviation Regiment in mid-1941. It is painted in the Medium Green over Light Blue camouflage typical of many late SBs at the time. The dorsal 7.62mm ShKAS machine gun is mounted in a MV-3 turret.



This light was located just to the left of the pitot tube used to collect airspeed data. Late production aircraft had an additional circular window installed above the existing window on both left fuselage sides.

Shortly before SB-2-M-103 (1939) production superseded that of the SB-2-M-100-A, two features typical of the former variant were incorporated into the last SB-2-M-100-A production batches. Two rectangular windows were fitted to the right nose, while two circular engine cooling intakes were placed on both wings' outer leading edges.

An upgrade program for both the SB-2-M-100-A and the later SB-2-M-103 began in early 1940. The MV-3 turret replaced the original TUR-9 gun mount and the moveable canopy on the upper rear fuselage of some aircraft. This was performed as a field modification kit on the SB-2-M-100-A. A prototype MV-3 had been tested on an SB-2-M-100-A (Modified) in early 1937, but this unit had a flat top, compared to the ball-shaped MV-3 installed on production aircraft. It gave a full 360° field of fire, which was superior to the earlier TUR-9.

Retractable skis were installed on SB-2-M-100-As when snow depths exceeded 30 cm (11.8 inches). Main landing gear doors were removed when skis were installed to provide sufficient clearance. The ski equipped SB-2-M-100-A gave the *Vozdushnye Sily* (VVS, Soviet Air Force) the ability of operating from snow-covered airfields, which inhibited the use of wheel equipped aircraft.

*Gosudarstvennyi Aviatsionnyi Zavod* (GAZ; State Aircraft Factory) 22 at Fili and GAZ 125 at Irkutsk produced the SB-2-M-100-A with the three-bladed propeller between the Fall of 1937 and late 1939. These factories completed 926 SBs in 1937 with 853 built at Fili and 73 at Irkutsk. In 1938, Fili completed 1240 SB-2-M-100-As and Irkutsk built 177 for a total of 417 aircraft. Fili assembled 1435 SB-2-M-100-As and SB-2-M-103s in 1939 while 343 aircraft were completed at Irkutsk that year for a total of 1778 SBs.

SB-2-M-100-As were delivered to the VVS in overall natural metal finishes from January of 1937. Shortly before the Great Patriotic War began on 22 June 1941, Soviet *Bombardirovoch'nyi Aviatsionnyi Polki* (BAPs, Bomber Aviation Regiments) were ordered to paint green splotches over the natural metal upper surfaces. Most of these splotches were crudely hand painted. From 1939, SB-2-M-100-As received a factory-applied camouflage scheme of light green upper surfaces and light blue under surfaces. Soviet bombing SBs received green and dark gray upper surface finishes in 1943.

Prior to the Great Patriotic War, Soviet national markings – a red star with a thin black outline – were painted on the wing upper and lower surfaces and on the rear fuselage. Upper wing stars were deleted when the conflict with Germany began. An additional small red star was painted on the rudder in 1943.

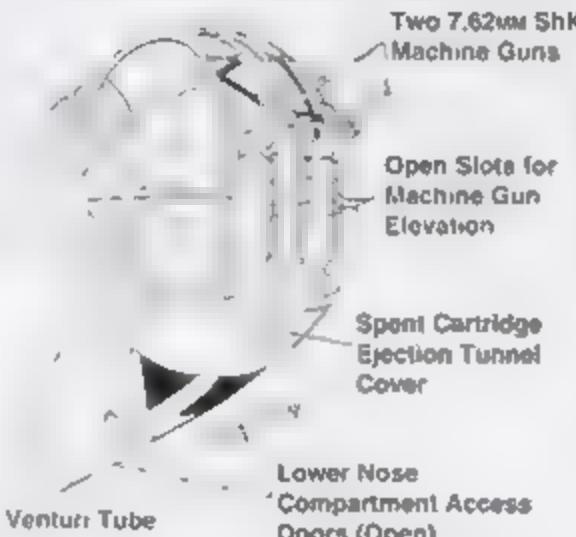
The Soviet Union supplied over 100 SB-2-M-100-A (Three-Blade Propeller) aircraft to China during their war with Japan. The *Ilmavoimat* (Finnish Air Force) captured one SB-2-M-100-A in the 1939-40 Winter War. This bomber served as VP-8 (later SB-8) until it crashed shortly after take off from Luonetjärvi, Finland on 25 October 1944.



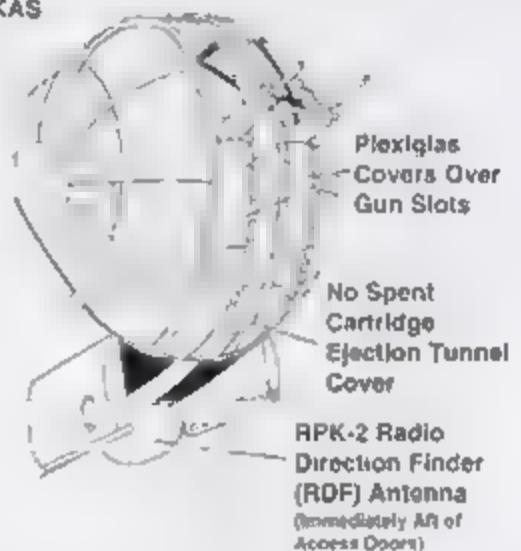
A temporary white winter camouflage was applied over the upper surfaces of this SB-2-M-100-A (White 9) in early 1942. This whitewash obscured the tactical number painted on the vertical stabilizer. Standard Soviet camouflage for this aircraft consisted of Dark Green (approximately FS34092) upper surfaces and Light Blue (approx. FS35414) undersurfaces. The canopy was removed from the radio operator/gunner's compartment, which exposed the TUR-9 ring mount. (RART)

## Nose Development

### SB-2-M-100-A (Early)

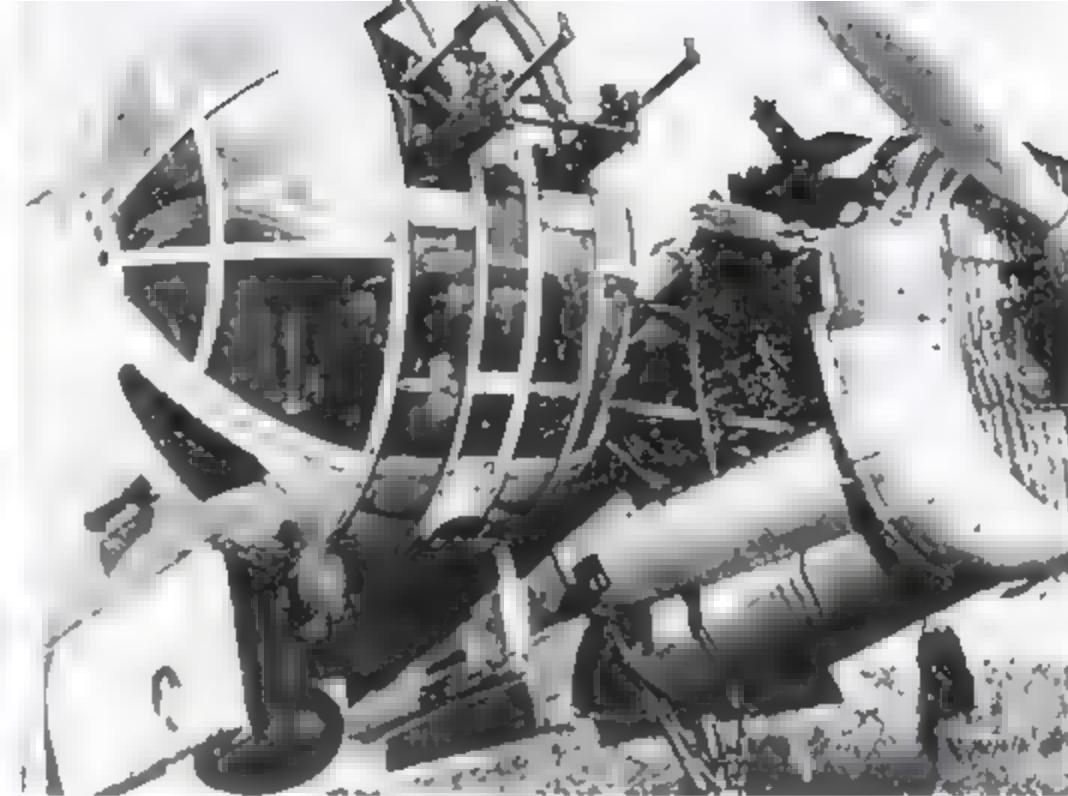


### SB-2-M-100-A (Late)





A late production, ski-equipped SB-2-M-100-A warms up its engines prior to a night mission against German troops near Moscow in March of 1942. The two inlets on the wing leading edge were rare on this variant but were common on later SB-2-M-103s. An antenna mast was mounted atop the windshield and canted left. The SB-2-M-100-A is equipped with a football-shaped RPK-2 Direction Finding (DF) antenna, a Soviet copy of an American Bendix device, on the lower nose. (Viktor Kulikov)



A damaged late production SB-2-M-100-A sits on a German-occupied airfield in the Soviet Union. This bomber is equipped with a RPK-2 DF antenna near the opened lower nose door. Late production SB-2-M-100-As had Plexiglas sheets installed in the nose glazing above and below the 7.62mm ShKAS machine gun barrels. These sheets reduced the amount of cold air entering the navigator/bombardier's compartment (RART).

## SB Ordnance

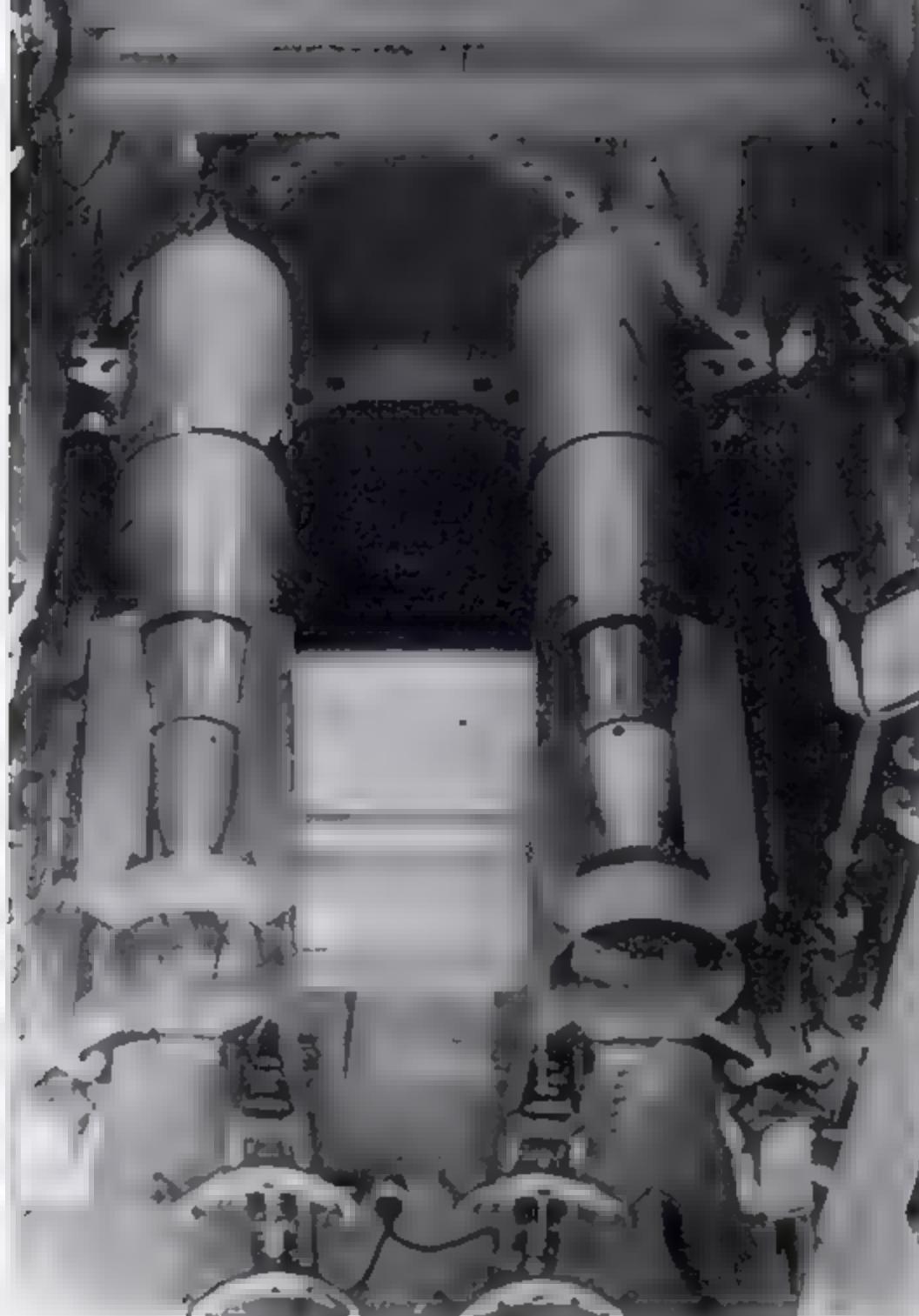
**250 KG (551 Pound)  
FAB-250 Bomb**



**100 KG (220 Pound)  
FAB-100 Bomb**



A 100 kg (220-pound) FAB-100 bomb is hoisted up to the left DER-19 wing pylon. This pylon was mounted on the late production SB-2-M-100-A's inboard wing undersurface between the fuselage and the engine nacelle. A winch mechanism fitted to the left main landing gear raised the bomb to the pylon. Each DER-19 carried up to 500 kg (1102 pounds) of ordnance to complement the bomb bay's 600 kg (1323-pound) maximum load. (Viktor Kulikov)



Two 100 kg FAB-100 bombs are vertically mounted in the rear section of the SB-2-M-100-A's bomb bay. Vertically stowed bombs were less accurate than horizontally carried weapons. Two DER-23 racks for horizontal carriage of 250 kg (551-pound) FAB-250 bombs are installed immediately forward of these weapons. The DER-23s replaced six 100 kg capable DER-34s.



A six-cell container for FAB-100 bombs is mounted in the forward portion of this SB-2-M-100-A's bomb bay. The weapons were loaded nose-up in each cell and secured to DER-34 bomb racks. No bomb racks are fitted to the rear of this bomb bay. The aft set of bomb bay door actuators was located on the aft bay bulkhead and operated in conjunction with actuators mounted at the bay's front. (Igor Mrkvaneck)



Soviet airmen push a late production SB-2-M-100-A (Red 14) towards a forested dispersal area early in the Great Patriotic War. Irregular green patches were hand painted over the upper surfaces of the overall natural metal aircraft. This type of scheme was painted shortly before the German invasion of the Soviet Union on 22 June 1941. Two circular windows on the rear fuselage were typical of late production SB-2-M-100-As. (Viktor Kulikov)

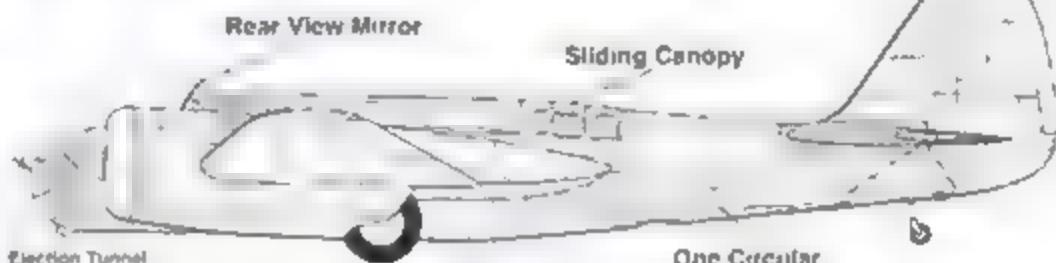


German troops examine a crash-landed SB-2-M-100-A in mid-1941. This bomber was equipped with an MV-3 dorsal turret and a radio antenna mast atop the fuselage. Few Tupolev SBs employed this type of antenna mast. Red stars were painted on the spinners fitted over the YISh-2 propellers' hubs. (Wolfgang Tamme)

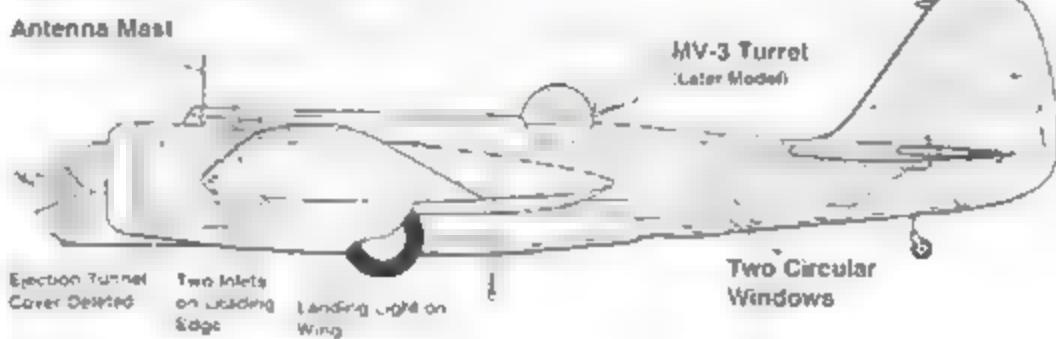


Finnish troops captured this late production SB-2-M-100-A during the 1939-40 Winter War with the Soviets. It was the sole M-100-A powered SB in the Ilmavoimat (Finnish Air Force) inventory. This bomber was assigned the Finnish serial number SB-8 and painted with full camouflage and markings, including yellow lower wing tips and alt fuselage band. It crashed soon after take off from Luonetjärvi on 25 October 1944. (Klaus Niinä)

## SB-2-M-100-A (Early)



## SB-2-M-100-A (Late)



# Polish-Soviet War

German and Slovak troops attacked Poland on 1 September 1939. At 0600 hours on 17 September, approximately 310,000 Red Army soldiers invaded Poland from the east.<sup>1</sup> The SB 2 M-100 A was the backbone of the VVS bomber fleet during the Polish Campaign.

The Belorussian and Ukrainian Fronts<sup>2</sup> had 637 SB-2-M-100 As available when the Polish-Soviet War began. They were assigned to the 10th, 16th, 18th, and 70th BAPs. Most SB-2-M-100-A missions on the campaign's first day were attacks on strategic railroad stations, including the Stanislawow and the Bielszce marshalling yards, and Polish airfields at Kowel, Dubno, and Lutz. Polish Air Force PZL P-11 fighters shot down two SB-2-M-100 As that day.

On 19 September, some of the few remaining P-11s unsuccessfully attacked two SB formations. The SB-2-M-100 As raided one of the last Polish Army strong points near Kamien Koszyrski three days later. The Polish Air Force collapsed at that time and the VVS then flew only sporadic missions over Poland. A formation of SB-2 M-100 As bombed the town of Nujno on 29 September.

SB-2-M-100-A operations were limited until the Polish campaign ended on 6 October 1939. This was primarily due to the lack of suitable targets. Only a handful of SB bombers were lost during the 20-day long war over Poland.

# Finnish-Soviet Winter War

From October of 1939, Soviet Foreign Affairs Commissar Vyacheslav Molotov pressed the Finns to cede a strip of southern Finland to the Soviet Union. The Soviet government felt that possessing this territory better protected the approaches to Leningrad (now St. Petersburg). Negotiations reached an impasse and Soviet troops invaded Finland on 30 November 1939. The Soviet Union deployed 3000 aircraft to subdue the Finns, who had 145 aircraft of various types in its inventory.

The SB-2-M-100 A remained the VVS's primary bomber in the Winter War against Finland. SBs flew the first Soviet air attack of the war, which was a raid on the Finnish capital of Helsinki. Many SB-2 M-100 As employed ski-equipped landing gear. Several SB-2-M-100 As fitted with MV-3 rear turrets were deployed to the Finnish Front. The VVS equipped six SB-2-M-100 As with wing-mounted rails for launching RS-132 unguided rockets. These rockets were primarily fired against ground targets.

The Finns captured eight salvageable SBs during the Winter War. These were repaired and placed in *Hinaavimmat* (Finnish Air Force) service.

Overwhelming Soviet pressure caused the Finns to yield on 13 March 1940. Finland ceded the desired buffer zone to the Soviets, however. VVS losses were enormous – between 700 and 900 aircraft, half of which were bombers. Soviet forces sustained 200,000 casualties. VVS commander Yakob Shumskiyevich was removed from his post after the Winter War ended and was finally executed in October of 1941.



Soviet airmen gather beside a late production SB-2 M-100 A prior to a mission during the 1939-40 Winter War with Finland. The upper venturi tube was deleted from the right nose on this variant. Green paint was hand-applied in irregular streaks over the natural metal finish. (RART)

A ski-equipped SB-2-M-100-A (Blue 8) takes off during the Winter War. The opened rear canopy allowed the radio-operator/gunner to quickly escape in the event of an accident. This late production SB-2-M-100-A had the two circular rear fuselage windows. The natural metal aircraft has red vertical stabilizer trim and a yellow all fuselage finish. (RART)



<sup>1</sup> The date of the Soviet invasion of Poland is often cited as 1 September 1939, but the actual date was 17 September 1939. The date of 1 September 1939 is the date of the German invasion of Poland.

<sup>2</sup> A Soviet Strategic Air Force unit.



This early production SB-2 M-100-A (Red 4) made a 'wheels-up' landing after German fighters engaged this bomber. The attack occurred soon after Operation BARBAROSSA – Germany's invasion of the Soviet Union – began on 22 June 1941. Crudely painted green streaks were applied over the natural metal upper surfaces in the field. (ECPA)

VVS aircraft rarely used the tactical number 0 (Zero) however, this abandoned late production SB-2 M-100-A (Red 0) was an example. The number is painted on the rudder. German troops inspect the aircraft after the Wehrmacht captured this Soviet airfield in 1941. This SB has the lower nose mount for the RPK-2 DF antenna, but this device was not installed on the bomber. (Wolfgang Tammo)



German troops captured this damaged late production SB-2 M-100-A in the Summer of 1941. An MV-3 dorsal turret was retrofitted to this aircraft in the field. This SB's camouflage consisted of Medium Green (approx. FS34151) upper surfaces and Light Blue undersurfaces. (Harold Thiele)

## The Great Patriotic War

The Wehrmacht (German Armed Forces) launched Operation BARBAROSSA – the invasion of the Soviet Union – on 22 June 1941. The Tupolev SB was the most numerous bomber in the VVS inventory at the time of the German attack. German aircraft destroyed 1811 Soviet aircraft – many of them SBs – on the first day of the campaign. Five years after its operational debut over the skies of Spain, the SB was totally obsolete and an easy prey for the Luftwaffe. On 22 June, a Regiment of SBs took off to bomb Königsberg, East Prussia from Kaliningrad, Russia, but none of these bombers returned to their home base.

The Petlyakov Pe-2 light bomber was faster than the SB, thus, the Pe-2 was less vulnerable to Luftwaffe fighters. Many SB-2 M-100-As flew at night when the Luftwaffe could hardly intercept the Soviet bomber. The SB carried 600 kg (1323 pounds) more bomb load than its successor, the Pe-2. Additionally, Soviet bomber pilots considered the SB's flying characteristics far superior to those of the Pe-2. The VVS had 28 SBs and only five Pe-2s available during the Battle of Moscow in late 1941.

SB-2 M-100-As enjoyed one advantage over the Luftwaffe with winter's arrival in late 1941. A ski undercarriage allowed the Soviet bomber to operate from snow-covered airfields when wheel-equipped German fighters were grounded due to snowfall. The SB was numerically the most important Soviet Bomber in the Stalingrad (now Volgograd) sector when the battle for that city began in mid-1942.

The SB-2 M-100-A and SB-2 M-103 served on the Eastern Front well into 1943. They were then withdrawn when sufficient numbers of Pe-2 and Tupolev Tu-2 bombers became available to the Soviet BAPs (Bomber Aviation Regiments). SBs remained in use for transport, liaison and special duties until World War Two ended in Europe on 9 May 1945.



The first SB-2-M-103 (1/83) had the 960 hp M-103 engines installed in the same cowlings as the earlier SB-2-M-100-A's. Two DER-19 bomb racks under the wings each carry one 500 kg (1102-pound) FAB-500 bomb. This configuration was only used on overload tests. (Viktor Kulikov)

## Tupolev SB-2-M-103

The 960 hp Klimov M-103 engine was tested for the first time in an SB in September of 1937. Introduction of this new engine changed the aircraft's designation to SB-2-M-103. This powerplant was the sole external difference between this new variant and the SB-2-M-100-A.

The M-103's 960 hp take off rating was 100 hp more than the M-100-A powerplant. This additional power was gained through a higher condensation (stalling) liquid to gas ratio of 1:6.6 compared with the 1:5.8 on the M-100-A. Both the M-103 and the M-100-A had the same physical dimensions, which resulted in few modifications for installation of the new engine. The M-103's 500 kg (1102 pound) weight was 20 kg (44 pounds) heavier than the M-100-A. The new engine burned 92-octane aviation gasoline, compared to the M-100-A's 85-octane fuel, which helped increase engine horsepower.

Only a few SB-2-M-103's were built with the nacelle-mounted oil cooler configuration adopted from the earlier SB-2-M-100. These included two machines (1/83 and 2/83) produced at GAZ-22 at Izh that were the first and second aircraft of production batch number 83.

Two DER-19 pylons were mounted on the wing undersurfaces of both SB-2-M-103's, which were used for various tests. Each pylon held up to 500 kg (1102 pounds) of ordnance. The two pylons combined with the 600 kg (1323 pound) bomb bay capacity to increase the SB-2-M-103's total bomb load to 1600 kg (3527 pounds). The first SB-2-M-103 (1/83) conducted an overload program between 27 July and 19 September 1938. This tested the flight characteristics of an aircraft carrying a greater than specified fuel and bomb load. The second SB-2-M-103 (2/83) was fitted with two 368 l (97 gallons) fuel tanks that were mounted on the DER-19 wing pylons. Flight tests conducted between 20 September and 8 October 1938 proved that the additional 736 l (194 gallons) of fuel increased the aircraft's range by 300 km (186 miles).



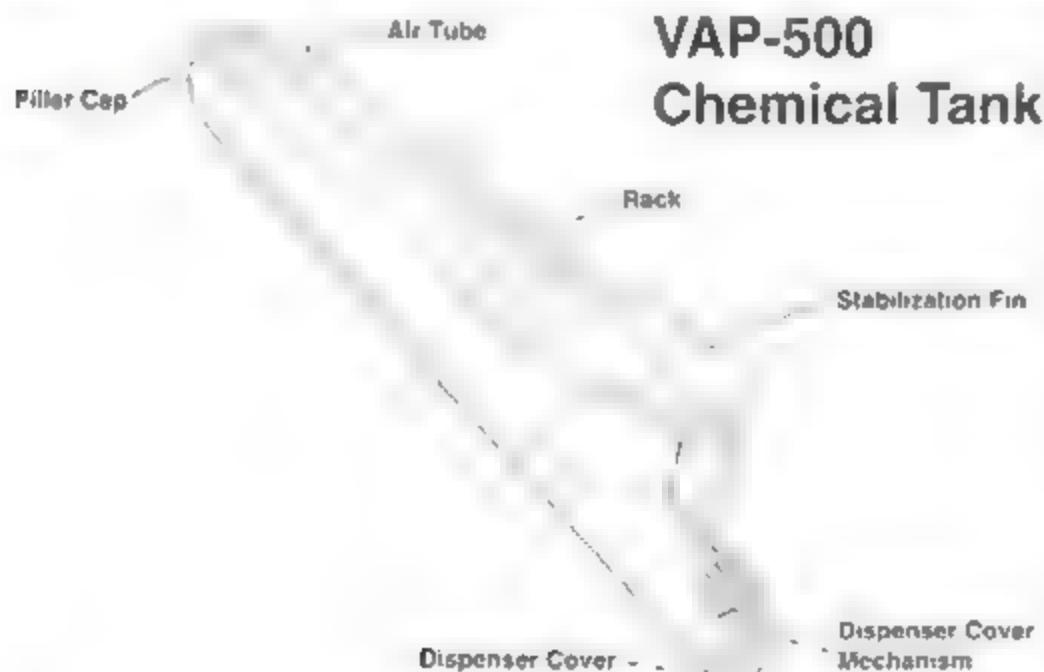
Two 368 l (97-gallon) fuel tanks are fitted to the DER-19 wing pylons of the second SB-2-M-103 (2/83). These tanks extended the aircraft's range by approximately 300 km (186 miles) to approximately 1900 km (1181 miles). The first two SB-2-M-103s were tested at Kratovo between 20 September and 8 October 1938. These aircraft shared the same nacelle-mounted oil cooler configuration as the earlier SB-2-M-100-A. (Viktor Kulikov)

The 368 l external fuel tanks complemented the 1670 l (441 gallon) maximum internal fuel capacity. Internal fuel was carried in four tanks mounted within the wings. No national markings were painted on the second SB-2-M-103. Two wrecked Polikarpov U-2 utility aircraft are located off the bomber's right wing. Aircraft wreckage commonly littered Kratovo airfield during the pre-World War Two period. (Viktor Kulikov)





Two VAP-500 chemical weapons dispensers are mounted under the first SB-2-M-103 (1/83). Each dispenser contained up to 315 L (83 gallons) of mustard gas. This aircraft was employed on aerial spraying trials from July through September of 1938. The Soviet Union stored large amounts of mustard gas and VAP-500s when the Germans invaded in 1941; however, the Red Army never employed chemical weapons against the Wehrmacht.



## SB-2-M-103 with VAP-500 Chemical Tank

Even Russia's troops suffered the heaviest casualties from German chlorine gas and phosgene attacks of any nation involved in World War One. German gas attacks on the Eastern Front were estimated to have killed or wounded 500,000 Russians. Counterrevolutionary White forces used British-supplied chlorine and phosgene against the Communists (Reds) during the Russian Civil War (1918-1921).

In 1924, the RKKA established the Military Chemical Agency to develop and produce chemical weapons. Four years later, a group of approximately 30 German scientists were sent to a factory near Volsk, where they assisted Soviet chemists in the 'Tomka-Project' to develop and produce mustard gas. Soviet *Vozhd* (Leader) Josef Stalin ordered large-scale production of mustard gas in the mid-1930s. Large factories for this effort were built at Branyushki, Kuybyshev (now Samara), and Karaganda. Simultaneously, the VVS (Air Force) developed several containers for dispensing the mustard gas from various fighter and bomber aircraft.

The first SB-2-M-103 (serial number 1/83) was employed on weapons trials between 27 July and 19 September 1938. One of these tests investigated the SB's suitability for carrying chemical agents, which would be sprayed over enemy troop concentrations. Two prototype VAP-500 spray containers were mounted on the DFR 19 wing pylons. The *Rabochiye Krest'yaninov Krasnoi Armii* (RKKA, Workers and Peasants Red Army) regarded mustard gas and other chemical agents as highly efficient weapons. While initial tests using VAP-500 containers were underway in the Soviet Union, Japanese forces employed chemical and biological weapons during its invasion of China.

The VAP-500 had a capacity of 315 L (83 gallons) of mustard gas. It was 2650mm (104.3 inches) long and had a gross weight of 295 kg (1091 pounds). The mustard gas was dispersed over the target area in three to nine seconds. The VAP-500 was opened either mechanically or pyrotechnically using the SB's FSB-2 bomb release system. The tank could be jettisoned from the aircraft in an emergency.

Initial trials with the SB-2-M-103 at Krasovo (now Zhukovsky) showed that the aircraft had no technical problems with carrying two VAP-500s. Subsequent field evaluation of the VAP-500 proved the SB's suitability as a chemical weapons carrier. The VAP-500 entered large-scale production shortly after the trials ended. This device was delivered in an overall aluminum finish.

Quantities of VAP-500s and mustard gas were stored on various Soviet airfields near the German frontier when the Wehrmacht attacked the Soviet Union on 22 June 1941. The Germans captured several containers and stocks of the gas during their rapid advance into enemy territory. The Soviet Union never employed chemical weapons against Axis forces during the entire Great Patriotic War. This was due to the Kremlin's fear that Germany would reply by using more deadly gases, a fear that was greatly justified. In late 1936, Dr. Gerhard Schrader created Tabun - the first nerve gas, which was considered extremely lethal. The German chemical firm IG Farben produced more than 12,000 kg (13,228 tons) of Tabun at its top secret Hochwerk plant at Dyhrenfurth, near Breslau (now Wroclaw in Poland). The Red Army seized this facility nearly intact in January of 1945. Soviet forces subsequently captured two smaller plants producing the even deadlier nerve gases Sarin and Soman. Material and information found at these facilities greatly aided Soviet nerve gas production efforts after World War Two.



The first SB-bis-3 prototype lacked both the wing-mounted landing light and the upper fuselage antenna mast. Two oil cooler inlets were added to the wing leading edge outboard of the nacelles, while the enlarged spinner fitted with the revised cowling. The small horizontally mounted inlet on the upper cowling was mounted vertically on subsequent aircraft. No national markings appeared on the SB-bis-3. (Viktor Kulikov)

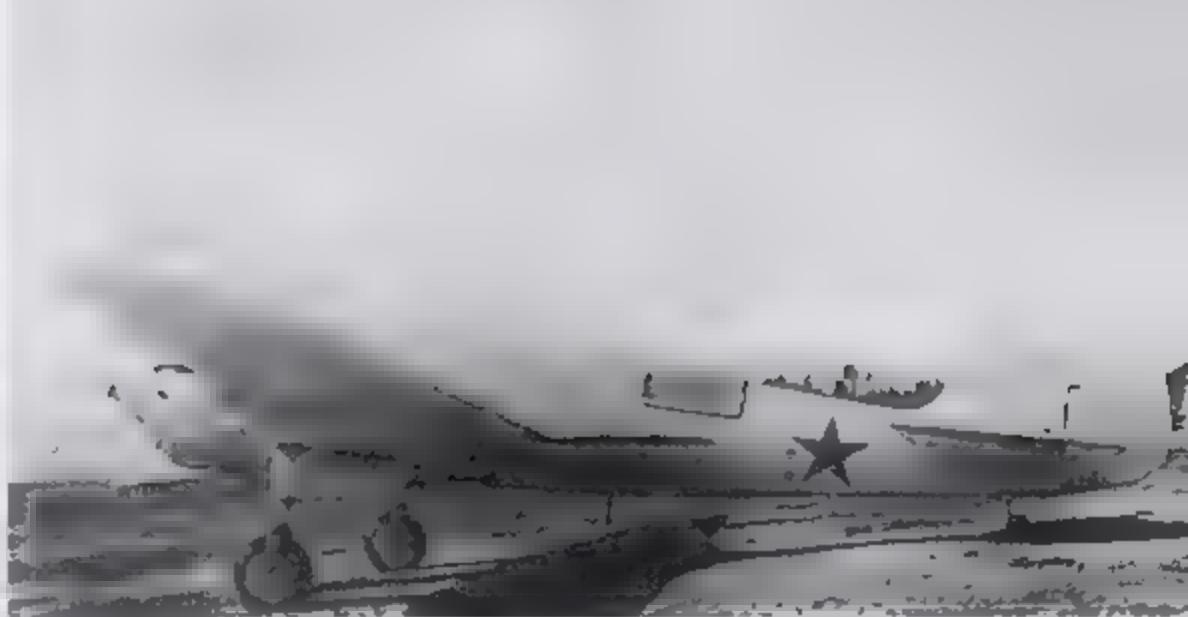
## Tupolev SB-bis-3

TsAGI (Central Aero and Hydrodynamics Institute) presented wind tunnel research results in late 1937. This research showed that a major redesign of the oil and water radiators for the Klimov M-103 engine would result in a considerable speed increase. TsAGI passed this information to the Tupolev Design Brigade, where the basic data led to a new engine cowling design for the SB. The prototype was designated SB-bis-3.

This prototype used an early SB-2-M-100-A airframe that lacked radio equipment and the wing leading edge landing light. Tupolev later built a second SB-bis-3 from a standard production SB-2-M-100-A equipped with three-bladed propellers.

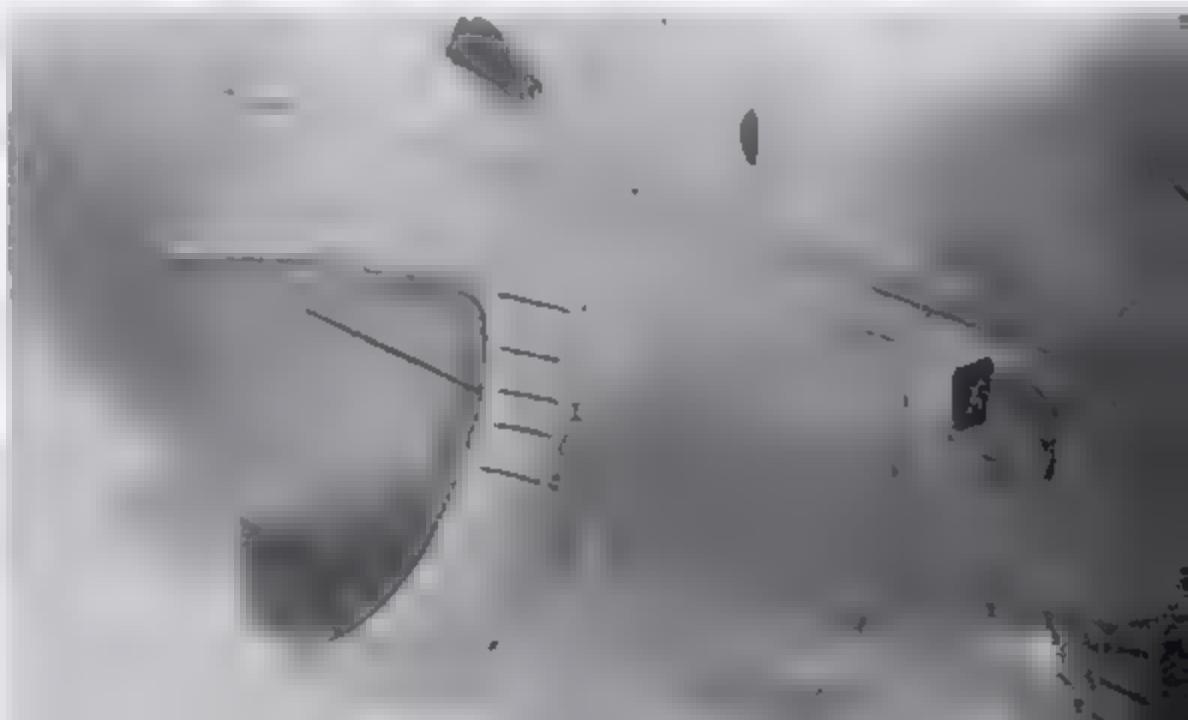
The SB-2-M-100-A featured a single large oil and water radiator with radiator shutters which had been placed in front of the engine. The SB-bis-3 had a larger propeller spinner and an aerodynamically cleaner engine cowling. The radiator was mounted below the engine and was cooled through a variable air intake mounted immediately in front of the radiator. A large carburetor intake was mounted on both the left and right cowling sides. The SB-2-M-100-A's lower cowling air flap was greatly reduced in size on the SB-bis-3. Two air inlets for the wing mounted oil coolers were fitted to the outer leading edges of both wings.

The SB-bis-3 underwent factory tests from 1 November 1937 to 17 January 1938. Evaluation of the test results indicated several shortcomings in the new cooler configuration. It took nearly one year to solve all these problems and to clear the SB-bis-3 for mass production.



Radio equipment missing from the first prototype was installed on the second SB-bis-3 prototype. This aircraft also had two circular windows located on the rear fuselage. National markings are painted on the wings and aft fuselage of the second SB-bis-3. (Viktor Kulikov)

The SB-bis-3 nacelles had small water coolers and tunnel-shaped intakes. These coolers were enlarged on production SB-2-M-103s. Prototypes had variable position air intakes and radiator exhaust ducts. The small intake scoop above the tunnel was mounted slightly upward on the SB-bis-3, while SB-2-M-103s had this scoop mounted vertical to the panel line. (Viktor Kulikov)

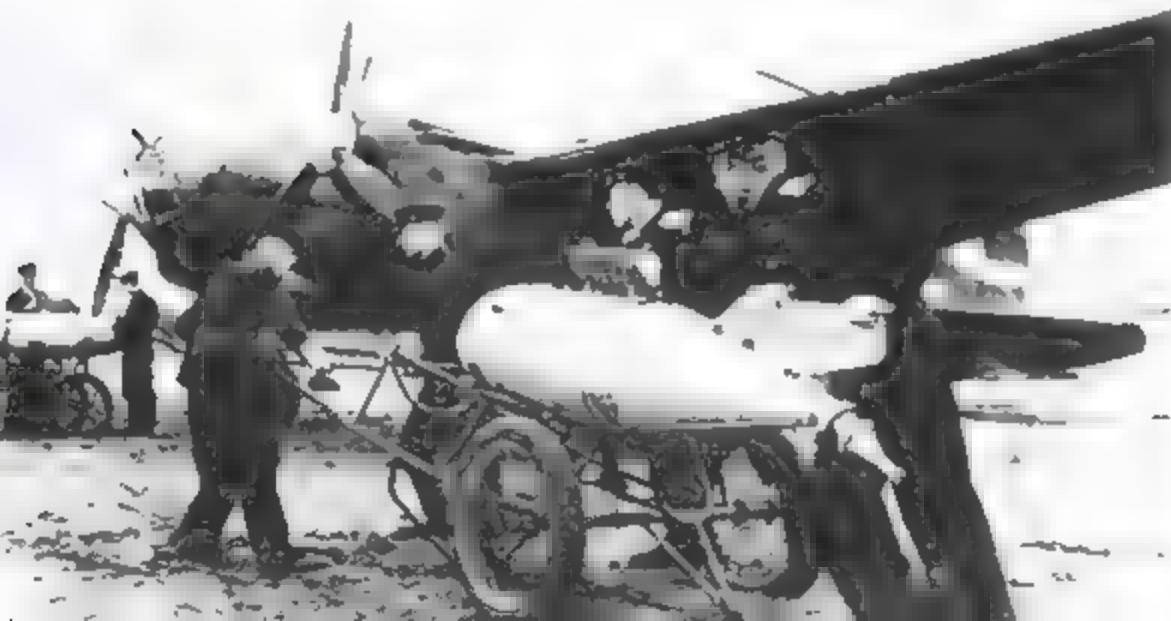


# Tupolev SB-2-M-103 (1939)



The air intake tunnel is fully closed on this early SB-2-M-103 (White 21). This was a common configuration when warming up the engines in the winter. The radio antenna mast is mounted in a non standard position in front of the windshield. A temporary white winter camouflage was applied over the upper surfaces. (Robert Bock)

Aviatsiya Voenno-Morskovo Flota (AVMF: Red Navy Aviation) crewmen bring a liquid phosphorous container to an early SB-2-M-103 in 1943. It was assigned to the 1st Gvardiya Mine-Torpednaya Aviatsiya Polk (GvMTAP: Guards Mine-Torpedo Aviation Regiment) Red Banner Baltic Fleet. Soviet flyers dropped this incendiary weapon over German troop concentrations throughout the Great Patriotic War. This SB-2-M-103's upper surfaces are camouflaged in Black (FS37038) and Medium Green (approximately FS34151). (RART)



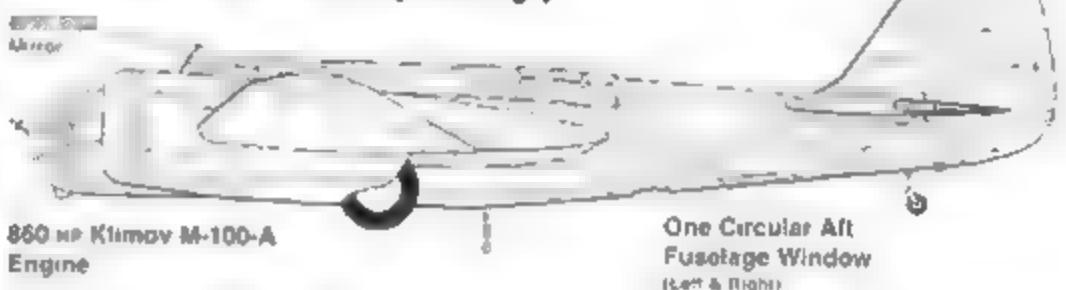
Early production SB-2-M-103 (1939) left the assembly lines at GAZ 22 at Fift and GAZ 123 at Irkutsk in late 1939. This was the standard production version based on the SB-2-M-1 prototypes that were built in small numbers in late 1937 and early 1938. Several time consuming modifications were required before the SB-2-M-103 (1939) entered mass production in late 1939. One such modification was a structural strengthening of the fuselage and the wing sections to accommodate the increased 1600 kg (3527 pounds) maximum bomb load. The first SB-2-M-1 had a small horizontal carburetor inlet on the engine nacelle; however, this inlet was repositioned to a slight vertical angle on the SB-2-M-103 (1939).

The SB-2-M-103 (1939) had a wingspan of 20.3 m (66 feet 7.2 inches), a length of 12.3 m (40 feet 4.3 inches), and a height of 3.6 m (11 feet 9.7 inches). These are nearly identical to the earlier SB-2-M-100-A. The newer SB-2-M-103 (1939) had an empty weight of 4768 kg (10,511 pounds) and a maximum weight of 7880 kg (17,372 pounds). Equivalent figures for the SB-2-M-100-A were 4138 kg (9123 pounds) and 5732 kg (12,637 pounds), respectively.

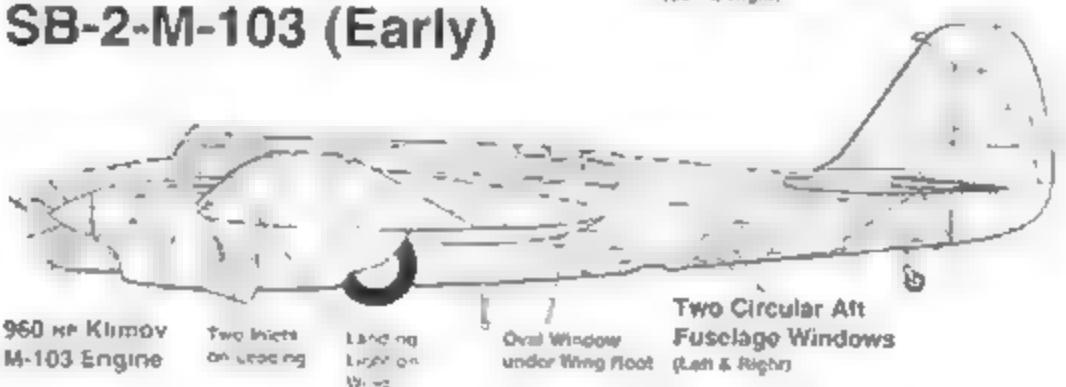
Defensive armament for the SB-2-M-103 consisted of four 7.62mm ShKAS machine guns. Two of these weapons were installed in the nose and each weapon was supplied with 800 rounds of ammunition. The dorsal ShKAS had 1000 rounds, while the gun fitted in the ventral position had 400 rounds. The 1600 kg (3527 pounds) bomb load included 100 kg (123 pounds) in the bomb bay and 1000 kg (2204 pounds) on two external bomb racks.

Two 960 hp Klimov M-103 12-cylinder liquid cooled, inline engines powered the SB-2-M-103. These gave the bomber a maximum speed of 450 kmh (280 mph) at 4100 m (13,451 feet). The earlier SB-2-M-100-A had a maximum speed of 423 kmh (263 mph) at 4000 m (13,123 feet). The newer variant's service ceiling was 9300 m (30,512 feet) and its maximum range was 1600 km (994 miles), although this was reduced to 600 km (373 miles) with a full bomb load. By contrast, the SB-2-M-100-A had a higher service ceiling of 9560 m (31,365 feet), but a

## SB-2-M-100-A (Early)



## SB-2-M-103 (Early)



duced maximum range of 1450 km (901 miles). The SB-2-M-103 had a crew of three: pilot, navigator/bombardier, and radio operator/rear gunner.

A 6mm thick armor plate was mounted immediately aft of the SB-2-M-103 (1939) pilot's seat. This variant also had an ASBR-3 mechanical emergency bomb release mechanism installed in the cockpit. This device was located in the navigator/bombardier's station on previous SBs.

The suffix (1939) was added to the SB-2-M-103 designation to distinguish this from earlier SB-2-M-103s. The latter variant had the large radiators which were standard on the SB-2-M-100-A. Large scale SB-2-M-103 (1939) production began after completion of the State Acceptance Trials at Kratovo in October of 1939.

There were several differences in details between the SB-2-M-100-A and the SB-2-M-103. The two balance weights on the right wing undersurfaces were deleted on the SB-2-M-103. This new variant had the two rectangular windows on the right nose that were added on late production SB-2-M-100-Aa. Several early SB-2-M-103s had a covering fitted to the cartridge case ejection tunnel in the nose and lacked the clear Plexiglas sheets in the nose machine gun slots. Most subsequent aircraft lacked the ejection tunnel and added the Plexiglas sheets.

Early SB-2-M-103s had a rear view mirror mounted atop the pilot's canopy frame. They also had a variable radiator air intake cover. Standard production aircraft deleted this mirror in favor of a radio antenna mast on standard production aircraft. They also substituted an aerodynamically refined radiator tunnel for the earlier variable covering.

Late production SB-2-M-103s replaced the oval window in the mid fuselage under the wing trailing edge with a circular window. Most SB-2-M-103s were delivered with the TUR-9 dorsal ring mount, however, some aircraft were fitted with the MV-3 turret that allowed a 360° field of fire. The MV-3 turret was retrofitted to several SB-2-M-103 at field repair depots. A handful of SB-2-M-103s were equipped with the MV-2 ventral turret.

Most SB-2-M-103s were equipped with VISH-2 three-bladed variable pitch propellers, which had a diameter of 3.3 m (10 feet 10 inches). Late production aircraft were fitted with VISH-22 three-bladed variable pitch propellers, which measured 3.8 m (9 feet 10 1/2 inches) in diameter. Pitch adjust range increased from 10° on the VISH-2 to 20° on the VISH-22.

Soviet State Aircraft Factories produced 2195 SB-2-M-103 (1939) aircraft in 1940, including 1820 at GAZ-22 in Lutsk and 375 at GAZ-125 at Irkutsk. The Soviets built 237 SB-2-M-103s during the first half of 1941, before production switched to the Petlyakov Pe-2. This brought total SB production to 6831 aircraft completed between 1936 and early 1941. GAZ-22 built 5695 total SBs, while GAZ-125 completed 1136 aircraft.

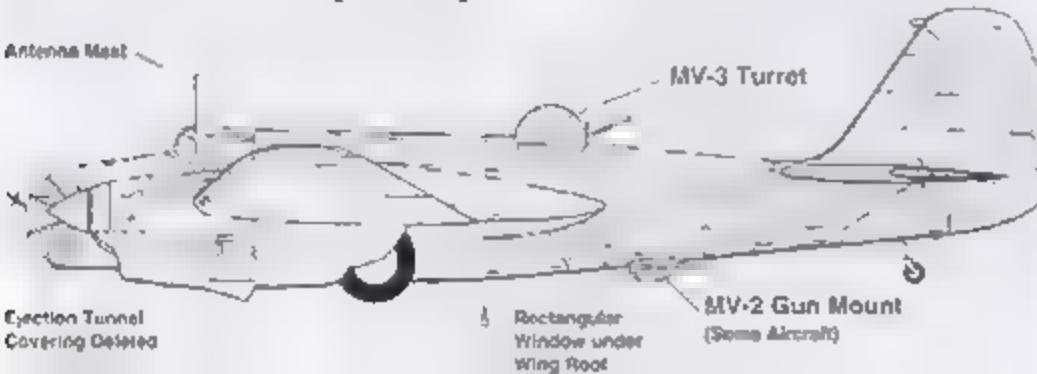


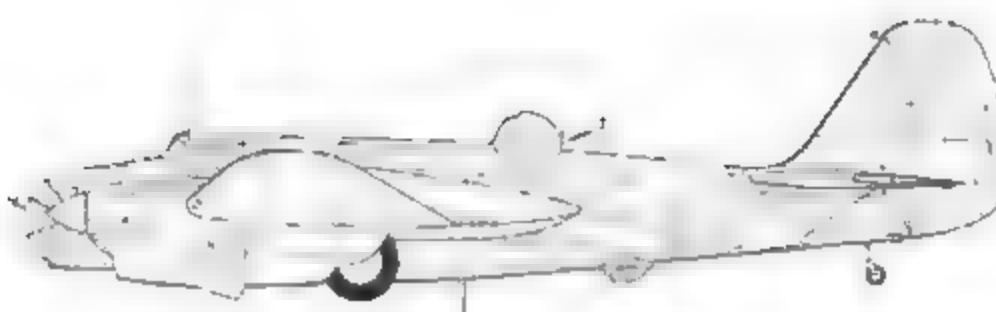
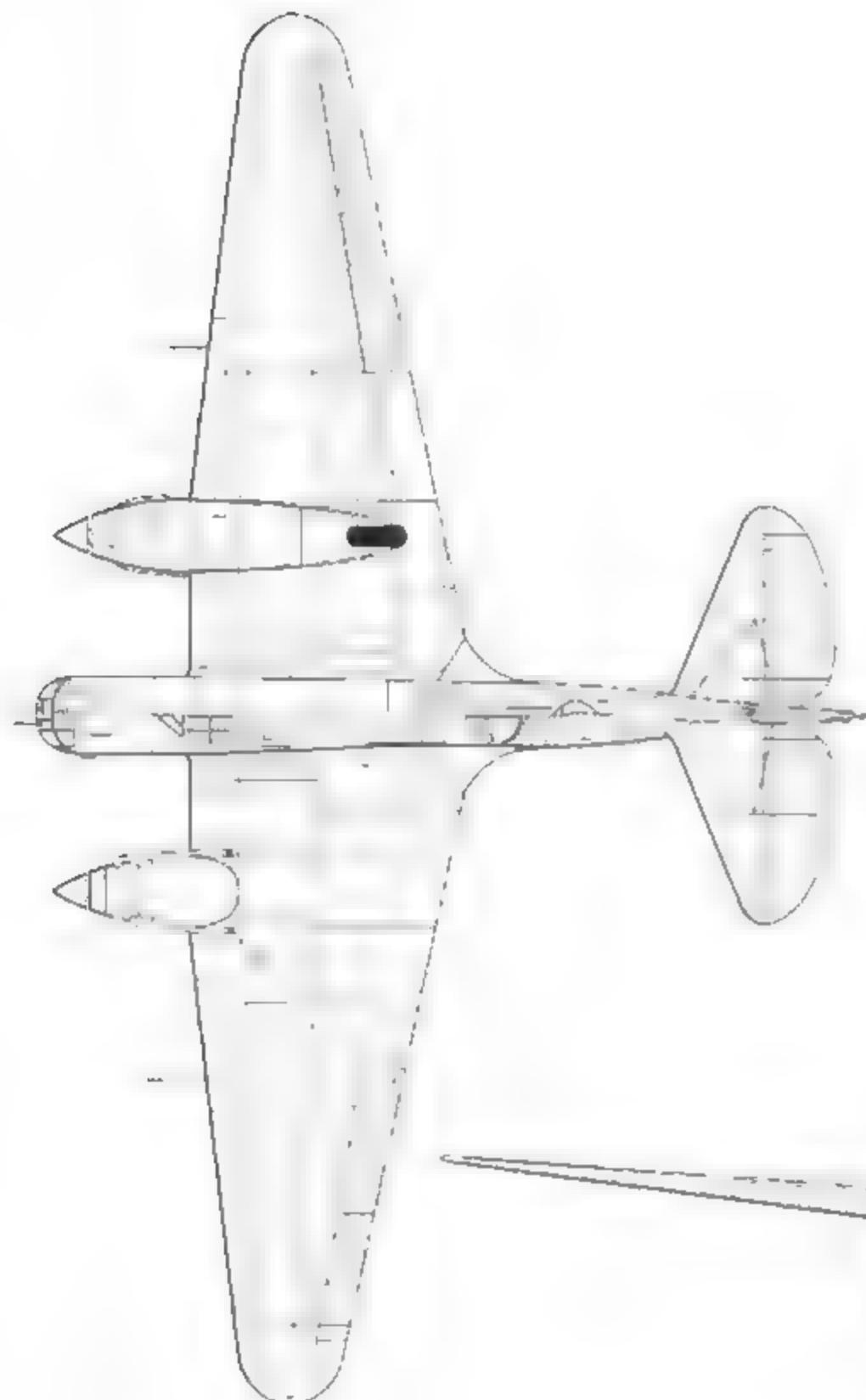
This early SB-2-M-103 (Red 3) begins its final approach to a Soviet airfield in the Summer of 1941, just days before the German invasion. The aircraft was finished in a newly applied camouflage of Medium Green upper and Light Blue lower surfaces. National markings – red stars with black trim – were painted on the wing upper surfaces and aft fuselage sides. The barely seen tactical number (3) was painted on the rudder. (Viktor Kulkov)

The German Wehrmacht captured this overall natural metal SB-2-M-103 at Riga, Latvia in 1941. This bomber is equipped with an MV-3 dorsal turret, which offered a greater field of fire than the earlier TUR-9 ring mount. No tactical number was painted on this SB-2-M-103. Abandoned aircraft in the background included two former Latvian Air Force Gloster Gladiator fighters. (RART)



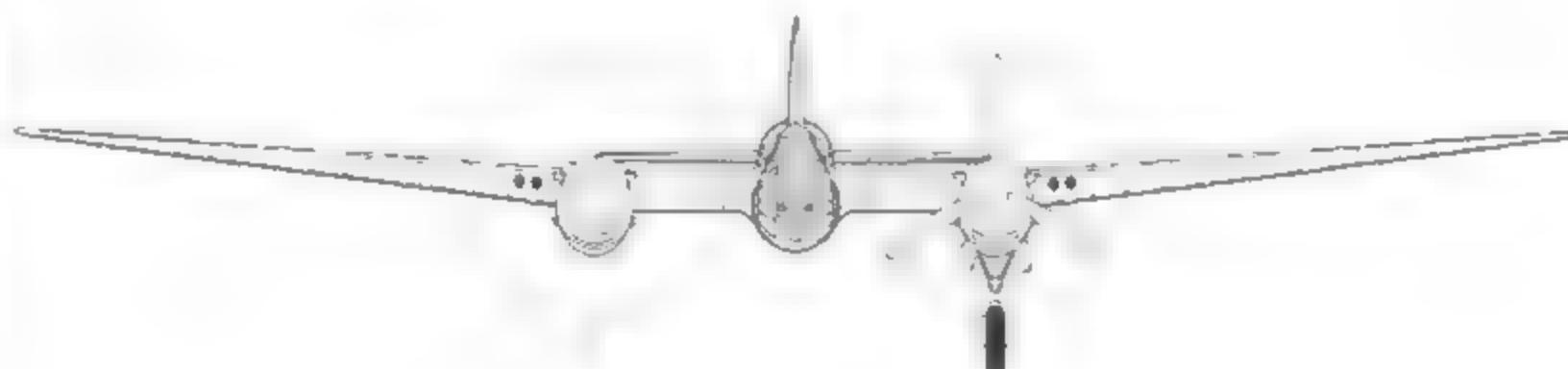
## SB-2-M-103 (Late)





## Tupolev SB-2-M-103 Specifications

Wingspan: 20.3 m (66 feet 7.2 inches)  
Length: 12.3 m (40 feet 4.2 inches)  
Height: 3.6 m (11 feet 9.7 inches)  
Empty Weight: 4768 kg (10,511 pounds)  
Maximum Weight: 7880 kg (17,372 pounds)  
Powerplant: Two 960 hp Klimov M-103 12-cylinder, liquid-cooled, inline engines  
Armament: Two 7.62mm ShKAS machine guns with 860 rounds per gun in nose, one ShKAS with 1000 rounds in dorsal position, and one ShKAS with 500 rounds in ventral position. Maximum bomb load of 1600 kg (3527 pounds).  
Performance:  
Maximum Speed: 450 kmh (280 mph) at 4100 m (13,451 feet)  
Service Ceiling: 9300 m (30,512 feet)  
Range: 1600 km (994 miles)  
Crew: Three





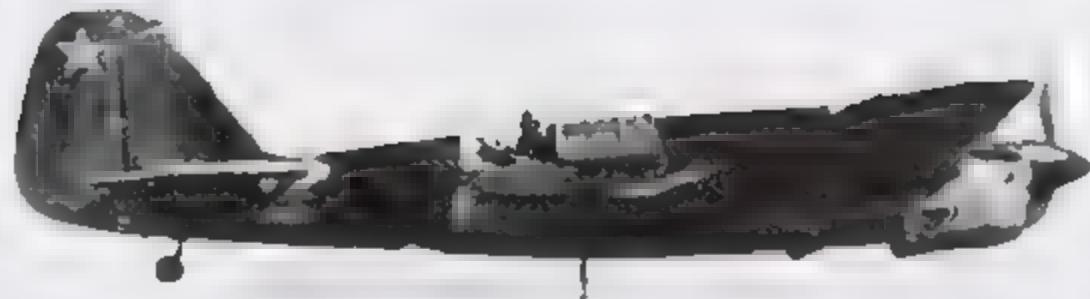
Tunnel radiators for the M-103 engines were mounted on the lower nacelles of both SB-2s-3s (Above) and subsequent production SB-2 M-103s. The fully opened upper mounted tunnel cover allowed the maximum amount of cooling air into the radiator. The M-103 turned a three-bladed VISH-2 variable pitch propeller.



Armors prepare to load a 100 kg (220-pound) FAB 100 bomb onto an SB-2-M-103 prior to a night bombing mission. This bomber carried up to six FAB-100s stowed vertically in its bomb bay. Two oil coolant intakes are fitted flush with the wing leading edge outboard of the nacelle. (RART)

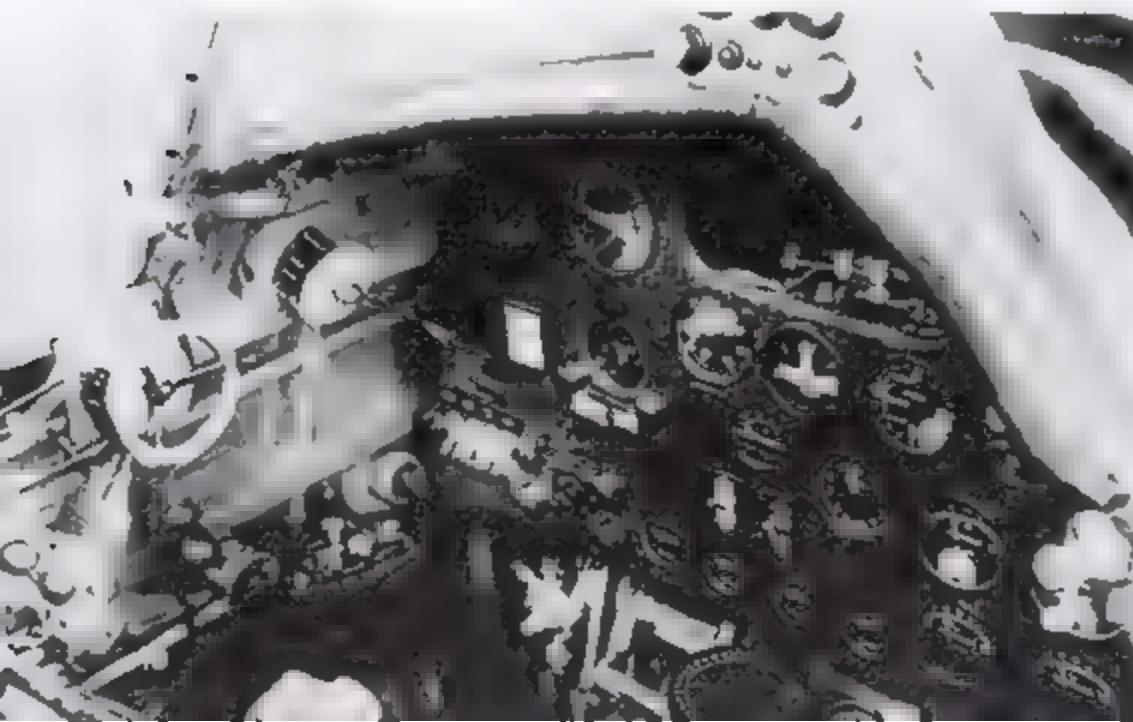


VVS (Soviet Air Force) personnel move an SB-2-M-103 towards its dispersal point at a frontline Soviet airfield. Both lower nose access hatches are opened. A rearview mirror is mounted atop the windshield for the pilot's use. Two manifolds located on the left and right sides carried exhaust from the 12-cylinder M-103 engines away from the aircraft. (Andrej Stetsenko)



An early production SB-2-M-103 flies over the front early in the Great Patriotic War. The radio operator/gunner has opened his canopy and pointed his 7.62mm ShKAS towards the left. Upper surfaces are camouflaged in Black and Medium Green. A small red star is painted on the upper rudder but no national markings are located on the rear fuselage and wing upper surfaces. (Viktor Kulikov)

The SB-2-M-103 instrument panel differed in few details from earlier variants. A canopy crank is located on the cockpit wall directly above the propeller pitch controls while the throttles are immediately aft of those levers. The compass is mounted immediately below the instrument panel's center section. This panel was flat Black, while the cockpit was primarily Interior Gray (FS24226).



Wohrmacht troops captured this intact natural metal SB-2-M-103 (Red 8) early in Operation BARBAROSSA in the Summer of 1941. This aircraft has a radio antenna mast mounted atop the windshield frame. The Germans sold 16 flyable SB-2-M-103s to Finland, which received them between November of 1941 and August of 1942. (Wolfgang Tamme)

Several SB-2-M-103s are lined up at a Soviet airfield in the Summer of 1944. SBs were removed from front line service during 1943, but remained in second line duties until the war's end in 1945. Removal of the propeller spinners revealed the hubs of the VISH-2 propellers. The second aircraft has the later Red Star national marking on the vertical tail, which had a wide white outline with a thin red edge. (Viktor Kulikov)





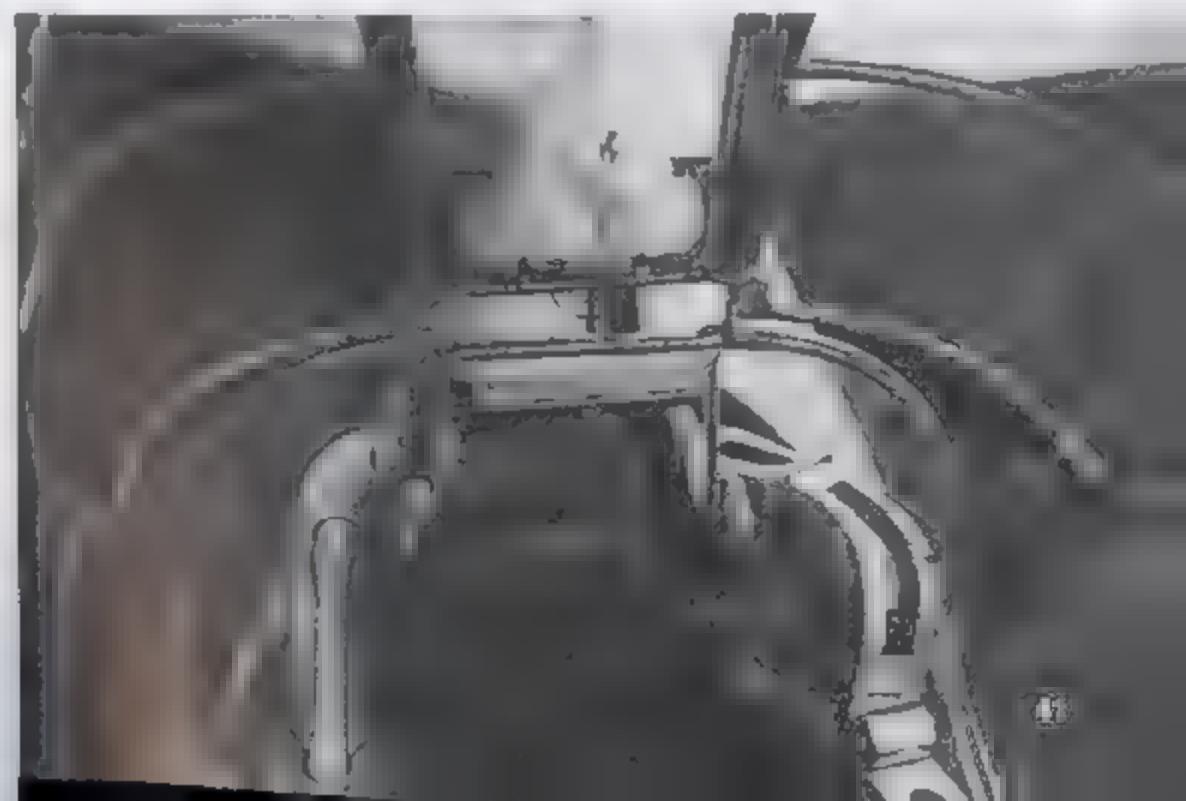
This late production SB-2-M-103 (White 2) is fitted with the MV-3 dorsal turret. A rectangular window replaced the original oval window under the rear wing trailing edge extension. Wooden bomb containers and pressurized air bottles littered the airfield near the aircraft. (Manfred Griehl)

The MV-3 dorsal turret was retrofitted to many SB-2-M-103s and was a standard item on other aircraft. This was the same turret installed on Ilyushin DB-3/II-4 heavy bombers. The 7.62mm ShKAS machine gun elevated through the slot provided in the turret's front section.



The Soviets abandoned this intact SB-2-M-103 to advancing German forces in the Summer of 1941. A crew boarding ladder rests against the left wing leading edge near the fuselage. Sharp demarcation lines separate the medium green upper surfaces and the light blue undersurfaces. (Manfred Griehl)

The MV-3's aft section was hinged at the front and opened up for access. This turret offered a 360° field of fire, which was a considerable improvement over the open-air TUR-9 ring mount fitted to earlier SBs. A simple ring and post sight is mounted atop the ShKAS's barrel. (Viktor Kulikov)



## SB-2-M-103 in Finnish Service



Finland's initial SB-2-M-103 was first registered VP-10. The early production aircraft had a cartridge case ejection covering on the lower nose. Finnish forces captured the aircraft during the Winter War. It was refurbished and delivered in a Light Gray (approximately FS36559) finish to LeLv (Flying Squadron) 6 at Nummela on 15 October 1940. No protective cover plates were fitted in the nose glazing slots. The nacelle air intake tunnel doors are opened. (Klaus Niska)

In September of 1941, the *Ilmavoimat* (Finnish Air Force) changed their first SB-2-M-103's registration from VP-10 to SB-1. Simultaneously, it was camouflaged with Black and Medium Green upper surfaces and Light Blue Gray undersurfaces. This SB destroyed two Soviet submarines in 1942: M-95 on 28 May and SHCH-302 on 14 October. The movable air intake tunnel doors are closed. SB-1 survived the war and was placed in storage on 2 February 1945. Its later status is unknown. (Klaus Niska)



The *Ilmavoimat* (Finnish Air Force) operated 23 SB-2-M-103s from 1940 until 1945. The Finns captured seven SB-2-M-103s during the 1939-40 Winter War with the Soviet Union. All of these bombers had made forced landings on Finnish territory.

The first SB-2-M-103 (VP-10) was overhauled at the *Vaasan Lentokonevehdas* (VL: State Aircraft Factory) at Tampere, Finland before it was delivered to the *Ilmavoimat* on 13 August 1940. On 15 October 1940, this bomber was assigned to *Lentolaivue 6* (LeLv, Flying Squadron) 6 at Nummela. The Squadron was directly subordinated to Finnish Navy Headquarters. The *Ilmavoimat* registered the remaining SBs – including the sole SB-2-M-100-A – from VP-2 to VP-8. VP-10 was re-registered VP-1 in June of 1941. LeLv 6 suffered its first loss on 2 August 1941, when VP-3 crashed at Nummela. The Finns changed the code for the remaining SBs from VP to SB in September of that year, but did not change the numerical suffix of each.

Finland's SB-2-M-103s were camouflaged with Black Green (FS34050) and Olive Green (FS34096) upper surfaces and Light Blue (FS353414) undersurfaces. Yellow (IS33538) was painted on the undersurface wing tips and the aft fuselage band. This identified Axis aircraft operating on the Eastern (or Russian) Front from mid 1941.

The *Luftwaffe* captured several SBs during the German invasion of the Soviet Union in the Summer of 1941. Finland purchased 16 SB-2-M-103s from German war booty depots. The first six aircraft (SB-9 to SB-14) arrived in Finland on 5 November 1941. The second five SB-2-M-103s (SB-15 to SB-19) were delivered in April of 1942, while the last five arrived in Finland the following August. All these SB-2-M-103s were refurbished at the VL, where some aircraft were equipped with additional carburetor air intakes on the engine cowling sides.

The *Ilmavoimat* assigned all 16 SB-2-M-103s to three flights of LeLv 6 at Nummela. These aircraft were deployed for bombing, reconnaissance, and anti-submarine missions over the Gulf of Finland. Lt. Virtanen flying an SB (SB-1) sank the Soviet coastal submarine M-95 east of Suursaari, Finland on 28 May 1942. The following 14 July, several SBs dropped depth charges on a surfaced submarine off Pielinksi. LeLv 6 claimed these attacks sank the SHCHUKA Class submarine SHCH-317. SB-1 attacked and destroyed the submarine SHCH-302 on 14 October 1942.

The Finns did not lose any SBs in enemy action during the 1941-44 Continuation War against the Soviets, however, six SB-2-M-103s were destroyed by accidents or technical failures. *Ilmavoimat* SB crews sank three Soviet submarines and damaged several other submarines. Additionally, these aircraft destroyed one merchant ship and four small vessels.

A Soviet advance through the Karelian Isthmus prompted Finland to sue for peace and an armistice was signed on 4 September 1944. *Ilmavoimat* SBs flew in the subsequent Lapland War that drove German forces out of Finland. The Finns over painted the Yellow lower wing and aft fuselage markings during this period. LeLv 6 SBs flew 84 anti-submarine patrol flights, but did not sink any German U-Boats (Unterseeboot Submarines). No SB-2-M-103s were lost while Finland fought alongside the RKKA (Red Army). *Ilmavoimat* national markings were changed from the light blue swastika on a white disc to a white, light blue, and white roundel on 1 April 1945. These markings were painted on the surviving SB-2-M-103s that were either operational or in storage depots.



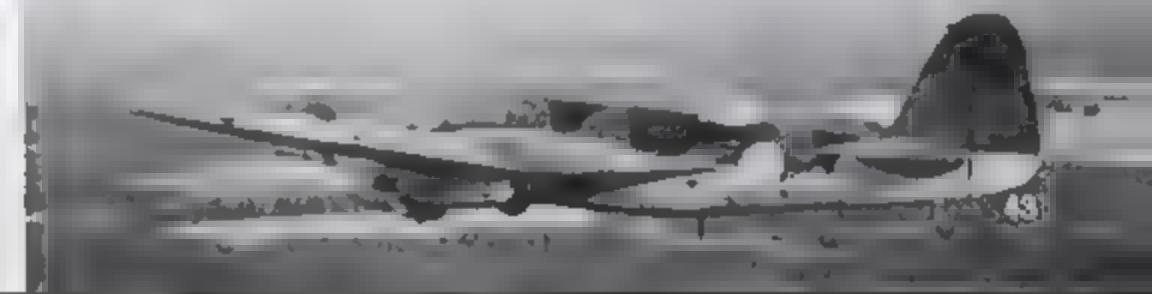
This late production SB-2-M-103 (SB-2) has the fixed radiator cooling tunnels that were standard on these aircraft. The Finns replaced the undercarriage wheels with skis for flying off snow-covered airfields. This aircraft was destroyed during a crash landing near Malmi on 6 April 1942 (Koski-Suomen Ilmailumuseo via Hannu Valtonen)

Rectangular filters were installed on the engine cowling carburetor air intakes of this Ilmavoimat SB-2-M-103 (SB-7). These filters kept dust from fouling the engine. Finnish troops captured this SB during the Winter War and it remained in service until the end of World War Two in Europe. (Klaus Niska)



The MV-2 ventral turret on this Finnish SB-2-M-103 (SB-11) was seldom installed on this variant. This turret offered improved field of fire over the simple ventral gun opening. Spinners were removed from the VISH-2 propellers for maintenance. SB-11 was carrying depth charges when it crash-landed at Malmi, Finland on 24 September 1942. The charges exploded upon landing and completely destroyed the aircraft. The crew's fate is unknown. (Klaus Niska)

LeLv 6's SB-2-M-103s were redeployed against German submarines after the Finnish-Soviet armistice was signed on 4 September 1944. Yellow aft fuselage bands and wing undersurface tips were overpainted for the subsequent Lapland War against Germany. Aircraft SB-20 is the nearest of two SB-2-M-103 flying over the Finnish countryside on 21 October 1944. (Klaus Niska)



## SB-2-M-103 in Chinese Service



No national insignia are painted on this newly-delivered Chinese Air Force SB-2-M-103. It has the large white serial number 0109 painted across the vertical tail while the smaller white code B-1727 is located on the tailfin. This production SB-2-M-103 has the rectangular fuselage window under the rear wing trailing edge extension. The bomber is camouflaged in Dark Green over Light Blue. (San Diego Aerospace Museum via Ray Wagner)

SB-2-M-103s saw wide use by Chinese forces during the Sino-Japanese War. Shortly after the first SB-2-M-103 left the GAZ-125 assembly line in late 1939, several aircraft were deployed to the Soviet volunteer squadrons in China. The first Soviet volunteer units began leaving China during this time. Although Soviet aid had stiffened Chinese resistance against Japan, the Soviets themselves had become disillusioned and frustrated. Their aircraft were misused and crashed by inexperienced pilots that would not follow or understand Soviet instructions. The Chinese borrowed the SBs instead of flying their own bombers.

On 27 December 1939, three SB bombers of the last Soviet volunteer unit in Hengyang flew southwest to support the fighting at Kunlun Pass. The last three Gloster Gladiator fighters left with the 28th Squadron escorting them. The remaining SB-2-M-103s were assigned to the 1st and 2nd Groups of the Chinese Air Force after the Soviet withdrawal.

Chinese flown SBs suffered heavy losses against the well-trained Japanese pilots. The Soviet Union supplied 100 new SB-2-M-103s – including some of the last production aircraft – in early 1941. These replaced aircraft lost the previous year to combat and accidents. China was the largest foreign operator of the SB, with 192 aircraft delivered from Soviet production lines. Soviet and Japanese Foreign Minister Yosuke Matsuoka signed a neutrality pact in Moscow on 13 April 1941. This resulted in a swift halt in the delivery of Soviet war material to China, but the SBs remained in Chinese service. A formation of SB-2-M-103s made three attacks on Japanese troops clearing Tung Ting Lake and raiding Ichang in September of 1941.

China's SB-2-M-103s served well into 1943. Curtiss P-40 fighters flown by pilots of the legendary American Volunteer Group (AVG) – the 'Flying Tigers' – escorted some of the SB missions.



An early SB-2-M-103 (Black 36) assigned to the Chinese Air Force is parked on a snow covered airstrip in China. Two US Army Air Forces (USAAF) Douglas C-47 Skytrain transports sit to the bomber's left. The SB's movable air intake tunnel doors were closed. The upper circular rear fuselage window was faired over. Blue rudder stripes and national insignia are painted on the natural metal SB-2-M-103. Both the stripes and the insignia lack the normal white sections. (San Diego Aerospace Museum via Ray Wagner)

# Tupolev PS-40

Tupolev developed a civil version of the SB 2 M-100 A (Three-Blade Propeller) for the Soviet state airline Aeroflot in 1937. The PS-40 (Passажирский Самолет, Passenger Aircraft) was the fastest aircraft in Aeroflot's inventory when the first batch was delivered to the airline in August of 1938. PS-40s were operated on the Moscow-Vladivostok and the Moscow-Tbilisi (now Tbilisi, Georgia)–Baku (Azerbaijan) routes before the Great Patriotic War. They flew both priority freight including mail and newspapers. Each aircraft also had provision for six passenger seats. The PS-40 had a maximum take off weight of 6400 kg (14,099 pounds) and a cruising speed of 341 kmh (212 mph) at 3800 m (12,467 feet).

The PS-40 differed in several details from the SB 2 M-100 A. The bomber's armament was deleted and the lower rear fuselage gun opening was faired over. Bomb racks were removed from the bomb bay and all combat-related equipment was deleted, but the cartridge case ejector tunnel on the nose was retained. The central nose glazing was replaced by a single-hinged door. This door provided access to the front cargo compartment. Two additional freight compartments were installed in the former bomb bay area and the rear gunner compartment. The three cargo compartments had a total volume of 2.6 m<sup>3</sup> (91.8 cubic feet). Some PS-40s lacked the rear view mirror placed atop the upper canopy frame and two aircraft lacked propeller spinners. Non-retractable skis replaced the main wheels during the winter. The PS-40s were operated in a natural metal finish with AF R01107 and the civil registration painted in black.

State Aviation Factories delivered 45 PS-40s to Aeroflot through December of 1939. Several aircraft were assigned to a Special Liaison Air Group at Myachikovo, near Moscow, after German forces invaded the Soviet Union on 22 June 1941. These PS-40s served as liaison aircraft between military headquarters in Moscow and the Transcaucasian Front.

# Tupolev PS-41

The PS-41 was a civilian version of the SB 2 M-103 (1939) bomber developed for Aeroflot. The first PS-41 was delivered in 1940 and 49 were in Aeroflot service that December. The airline had a 138,700 km (86,187-mile) network at the time.

All defensive armament, bomb bay racks, and other combat-related devices – including armor plating and bomb release systems – were deleted from the PS-41. The cartridge case ejector tunnel remained on the nose. Early PS-41s had a solid door in the central nose glazing while late production aircraft had an entirely solid nose. Additionally, triangular-shaped nose windows were deleted on all PS-41s. This aircraft had a payload of 970 kg (2138 pounds).

Most PS-41s had an additional antenna mast mounted atop the fuselage, behind the cockpit canopy. Several aircraft had this mast placed in front of the canopy frame. Most PS-41s were equipped with a rear view mirror atop the canopy frame. Aeroflot PS-41s were left in overall natural metal, with a black civil registration. The black Aeroflot logo was not always painted on the aircraft.

After the German invasion on 22 June 1941, the VVS assigned some PS-41s to liaison squadrons operating from bases in Moscow and the northern Soviet Union. The aircraft were employed on liaison duties between military headquarters in Moscow and the Transcaucasian front during the Great Patriotic War.

Beginning in 1940, several PS-41s were assigned to Artaarktika (Arctic Aviation). This organization operated in the Soviet Union's extreme northern region under highly primitive and severe conditions. Artaarktika PS-41s were equipped with a non-retractable ski undercarriage.



This overall natural metal PS-40 (SSSR-L2440/11-47) was flown by the Soviet state airline Aeroflot. Black civil registrations are painted on the aft fuselage sides and across the wing undersurfaces. Most Aeroflot aircraft of this period had SSSR-L series registrations. Spinners were removed from the VISh-2 propellers and a solid-two-piece cargo compartment door has replaced the center nose glazing. (Viktor Kulikov)

A groundcrewman loads mail sacks from a truck into a GVF (Civil Air Fleet) PS-41. This aircraft was a civil variant of the SB-2-M-103 (1939) bomber and replaced the latter's clear nose with a solid nose. Access to the nose compartment was through an upper-hinged centerline door. Cargo compartments in the nose, former bomb bay, and former rear gunner compartment had a total volume of 2.6 m<sup>3</sup> (91.8 cubic feet). (RART)





Mail is loaded onto a GVF PS-41 early in the Great Patriotic War. The three cargo compartments allowed this aircraft to carry a total payload of 970 kg (2138 pounds). An additional antenna is placed right behind the aft sliding cockpit canopy. Several Lisunov PS-84 (later Li-2) transports - license-built Douglas DC-3s - sit on the ramp near the PS-41. (RART)

A pilot stands near a late production PS-41 assigned to Aviaarktika (Arctic Aviation). Red nose engine cowling and bomb bay door markings aided in spotting this aircraft in the Soviet Union's extreme northern regions. A radio antenna mast is mounted in front of the windshield. This particular PS-41 retained the glazed nose usually found on SB-2-M-103 bombers. AVIAARKTIKA is painted in black on the nose. (Viktor Kulikov)



Non retractable skis were fitted to this PS-41 (SSSR-L3533) for winter operations. The skis replaced the conventional wheeled undercarriage which was less suitable for snow-covered airfields. The aircraft is in overall natural metal, with black markings.

These aircraft were painted with red noses and engine cowlings for increased visibility.

Aeroflot's PS-41s were absorbed into the *Gruzhdanskii Vozdushnyi Flot* (GVF: Civil Air Fleet) shortly after the Great Patriotic War began on 22 June 1941. These aircraft fulfilled the needs of the front and flew mail, matrices (printing plates) of central newspapers, other documents, and high-ranking officers and politicians. The PS-41 was also employed as a liaison aircraft between the newly established industrial centers east of the Ural Mountains and the *Kremlin* in central Moscow. This aircraft took advantage of its high speed to supply besieged Soviet defenses. PS-41s began transporting mail, medicines, and military staff into Leningrad (now St. Petersburg) soon after the Wehrmacht encircled the city in late August of 1941. These aircraft flew at low level over Lake Ladoga, northwest of Leningrad, during these missions. The PS-41s played an important role in supplying high priority items to Leningrad during the nearly 900-day long siege, which was lifted in late January of 1944.

Former VVS (Soviet Air Force) SB-2-M-103s were converted to PS-41s and assigned to the GVF during the conflict. This came about due to the availability of more modern bombers, including the Petlyakov Pe-2 and the Tupolev Tu-2. The converted PS-41s eased an acute shortage of transport aircraft during the Great Patriotic War.

The PS-41 was the GVF's main high-speed transport aircraft during the war. It served well over the conflict and, in its early variants, with the availability of more modern aircraft, including the Illyushin Il-12 (ASCC: code name Coax).

## Tupolev PS-41bis

The PS-41bis was developed as a fast mail aircraft with an extended range. It carried a pair of 270 l (71 gallon) auxiliary tanks on wing mounted DFR-19 bomb racks in order to increase its range over the PS-41's 1180 km (733-mile) range. Some structural improvements over the standard PS-41 were incorporated into this new variant. The PS-41bis had a total weight of 7000 kg (15,432 pounds).

<sup>1</sup>During the late Summer and Fall of 1941, Soviet authorities evacuated hundreds of war material factories to the Soviet Union, ahead of advancing German forces. These factories were taken east of the Ural Mountains, well outside the range of German bombers.

ASCC: Air Standards Coordinating Committee of the North Atlantic Treaty Organization (NATO)

# Tupolev SB-MMN

The Tupolev SB-MMN (*Mebitkatsi i Men she Aeroflotta* - Modified Reduced Wings Area) was an aerodynamically refined version of the SB-2-M-103. Two 1100 hp (take-off) pre-production Klimov M-105 engines powered this aircraft. Each M-105 housed a 1.1 m<sup>2</sup> (11.87 square feet) in an aerodynamically modified cowling. It was equipped with a centrifugal two-stage supercharger and turned a VISH 2T three-blade propeller.

The SB-2-M-103's 20.3 m (66 feet 7 inches) wingspan was reduced to 18 m (59 feet 0 inches) on the SB-MMN, with the corresponding wing area going from 56.7 m<sup>2</sup> (601.3 square feet) to 48.21 m<sup>2</sup> (518.9 square feet). Its tail was redesigned and reduced in size, while the nose section was redesigned with additional clear portions. Nose armament was reduced from two 7.62mm ShKAS machine guns to only one ShKAS. Additional wing tanks mounted in the wings increased the fuel capacity by 205 L (54 gallons). A second landing light was placed on the right wing leading edge. The SB-MMN had a gross weight of 6420 kg (14,153 pounds) compared to 7880 kg (17,372 pounds) for the SB-2-M-103.

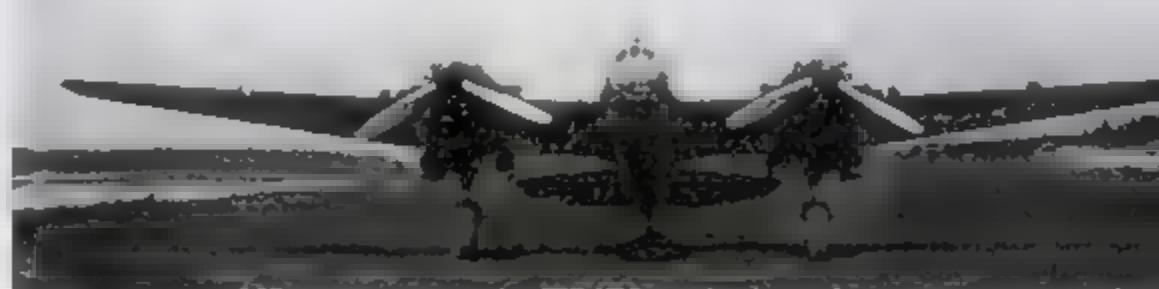
The SB-MMN's State Acceptance Trials began in September of 1939. It reached a top speed of 458 km/h (285 MPH) at 4200 m (13,780 feet) - 8 km/h (5 MPH) faster than the standard production SB-2-M-103. The smaller wing area resulted in an increased landing speed of 160 km/h (99 MPH). The SB-MMN did not pass the State Acceptance Trials due to three factors: its weak defensive armament, unacceptably high landing speed, and its only marginal speed increase over the SB-2-M-103. The sole SB-MMN prototype was allocated to Aeroflot, which nickname the aircraft *Shchuka* (Pike).

The SB-MMN also had a completely redesigned nose section over the SB-2-M-103. The entire upper nose was glazed for improved visibility. One nose-mounted 7.62mm ShKAS machine gun was mounted in the SB-MMN, compared to two nose-mounted weapons in the SB-2-M-103. (Viktor Kulikov)



The sole SB-MMN sits at Kratovo airfield between test flights in late 1939. Two 1100 hp Klimov M-105 pre-production engines powered this aircraft. These M-105s offered considerably greater power than the 960 hp M-103s installed on the SB-2-M-103. The SB-MMN appears to be overall Light Gray, with black engine nacelles. (Viktor Kulikov)

Two landing lights were mounted in the SB-MMN's wing leading edges - one each to left and right. Additionally the left pitot tube was moved from inboard to outboard of the leading edge landing light. The wingspan was reduced from the SB-2-M-103's 20.3 m (66 feet 7.2 inches) to 18 m (59 feet 0.7 inches) on the SB-MMN. This increased the aircraft's landing speed to 160 km/h (99 MPH). (Viktor Kulikov)



The SB-MMN received a redesigned vertical tail, which was smaller than the tail on the SB-2-M-103. No rudder mass balance was used on this prototype. The VVS rejected the SB-MMN for service and the sole prototype was given to Aeroflot. (Viktor Kulikov)





## SB Nose Wheel Undercarriage Test Bed

Igor P. Tolstikh led a TsAGI (Central Aero and Hydrodynamics Institute) project investigating aircraft employing a tricycle (nose wheel) undercarriage in 1940. This landing gear configuration was not entirely new in the Soviet Union. In 1934, the Kharkov KhAI-4 experimental aircraft was the first Soviet aircraft to employ a nose wheel.

A heavily modified SB-2-M-103 served as a test bed for the nose wheel configuration. Although it was never intended to build production SBs with nose landing gear, the test bed was intended to gain basic data for future Soviet bombers.

The nose section was stretched by an unknown amount and a small circular window on the nose and three squared windows on each side replaced the large nose glazing. A large nose wheel undercarriage with two bracing struts was installed. The non-retractable main undercarriage was enlarged and repositioned to the rear. The SB test bed had a gross weight of 6000 kg (13,228 pounds), which was 1880 kg (4145 pounds) lighter than for the SB-2-M-103.

Famed test pilot Marc I. Gallai flew this test bed on many of its taxi and landing trials. These tests showed that a three-wheel configuration was superior to the conventional tail wheel equipped bombers. Gallai and other test pilots considered take-offs and landings to be much easier than with 'tail dragger' aircraft.

TsAGI assigned the SB test bed to the *Nauchno-Issledovatel'skiy Institut* (NII; Flight Research Institute) at Kratovo, near Moscow, in late 1940. Trials continued at NII well into 1941, until the outbreak of the Great Patriotic War temporarily ended further interest in nose wheel equipped bombers. The first Soviet bombers equipped with a nose wheel undercarriage entered VVS (Soviet Air Force) service after the war's end.

One SB-2-M-103 was modified as a tricycle landing gear test bed in 1940. The main landing gear legs were repositioned from the front to the rear of the nacelles. The tail wheel was retained on this aircraft. (Viktor Kulikov)

The forward fuselage was lengthened and the nose glazing deleted on the tricycle landing gear test bed. This shifted the aircraft's center of gravity forward, which allowed it to rest on the nose landing gear. Taxi and landing tests were conducted at the NII (Flight Research Institute) from late 1940 until mid-1941. (Viktor Kulikov)

The SB-2-M-103 test bed had a fixed tricycle landing gear. Bracing struts were mounted between both engine nacelles. Tests demonstrated the superiority of the tricycle landing gear to a conventional tail wheel ('tail dragger') configuration. (Viktor Kulikov)



German troops examine a Tupolev USB (Red 1) abandoned at a Soviet airfield in 1941. This USB was rebuilt from a SB-2-M-103 bomber. The trainer nose was left in natural metal, while the rest of the airframe retained its bomber camouflage of Medium Green upper surfaces and Light Blue undersurfaces. Most USBs were modifications of existing bombers, while only a few were built as trainers at the factory. Wreckages of other aircraft are strewn near this trainer. (Andrzej Morgata)



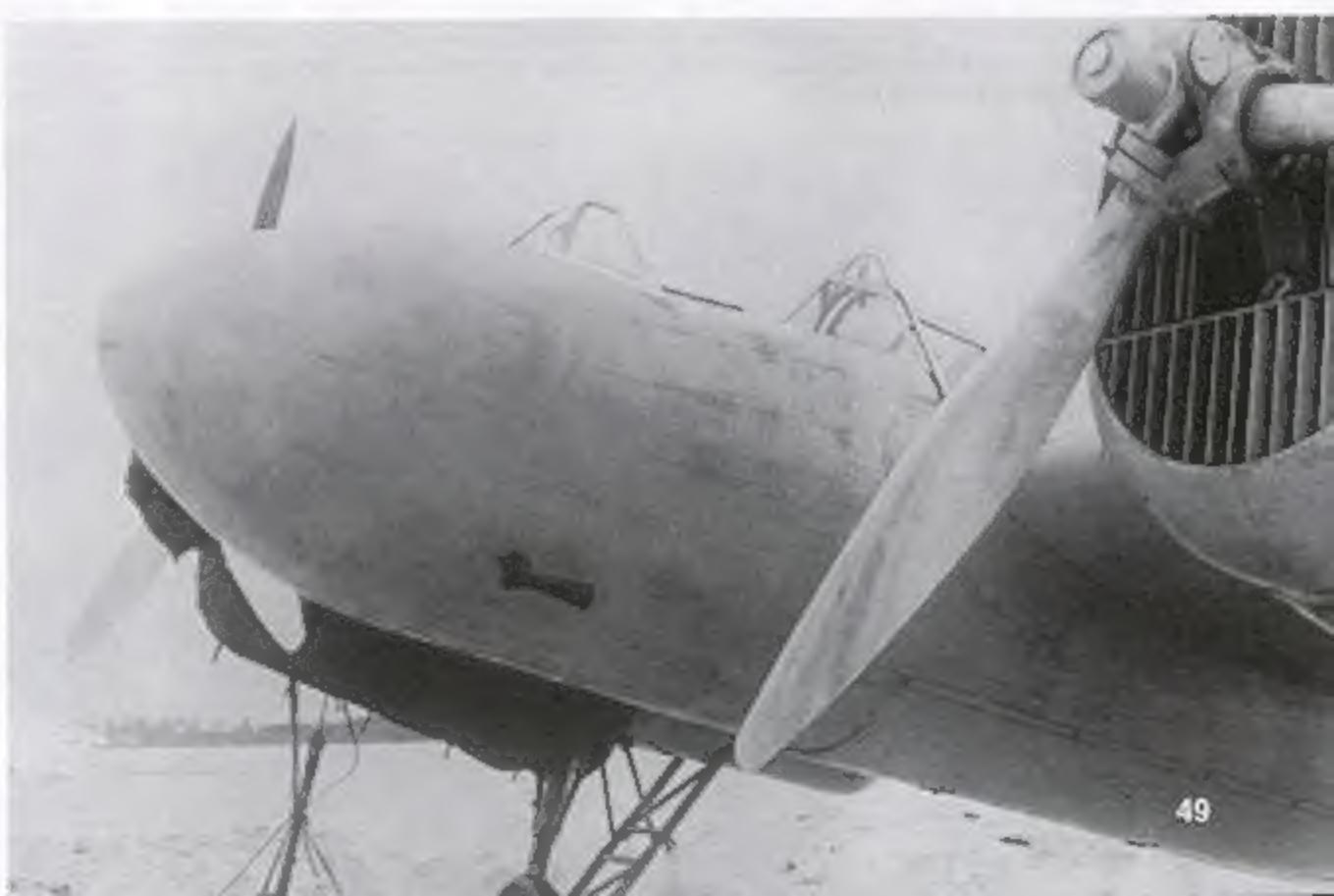
The USB prototype was based on an SB-2-M-100-A bomber. The instructor sat in the open cockpit immediately forward of the student's cockpit. Both cockpits had identical controls and instruments. The USB was employed on State Acceptance Trials between 11 and 16 March 1938. (Viktor Kulikov)

## Tupolev USB

The first Tupolev SB bombers left the production line in early 1936, but it took almost two years before a training version became available. The USB (*Uchebno Skorostnoi Bombardirovshchik*; Trainer Fast Bomber) prototype was based on a standard production SB-2-M-100-A (Three-Blade Propeller) and was built at GAZ (State Aircraft Factory) 22 at Fili. The entire nose section was cut away and a cockpit for the instructor was installed. The step was relocated from the front to the rear of the starboard nose. A windshield was installed in front of the instructor's compartment, but no canopy was provided for the instructor. The instructor's cockpit had identical instruments and controls to those in the pupil's cockpit. The rear cockpit controls were automatically disconnected when the instructor took command. Despite the importance of instructor/student communication, this aircraft lacked an intercom system between the two cockpits. Access to the instructor's cockpit was made using a ladder placed through the open ventral hatch doors.

The USB prototype underwent State Acceptance Trials between 11 and 16 March 1938. It was equipped with a non-retractable ski undercarriage during these tests.

GAZ 22 at Fili completed only a few new USBs. Most USBs were converted in the field from existing SB-2-M-103 bombers. The exact number of USBs built is unknown.



## Tupolev USB in Foreign Service



The *Ilmavoimat* flew one USB (SB-6) that the Finns converted from a captured SB-2-M-103 bomber in 1943. This aircraft had a landing light mounted on the right wing leading edge. It was finished with standard Finnish camouflage and markings, including yellow wing undersurface tips and aft fuselage band. (Klaus Niska)

The *Ilmavoimat* assigned its sole USB to *Täydennyslentolaivue* (T-LeLv; Advanced Training Squadron) 17 at Luonetjärvi. It was later assigned to a pair of bomber squadrons that flew SBs. The Finns retired their USB from service and placed it in storage on 24 February 1945. (Klaus Niska)



Finland captured eight SBs during the 1939-40 Winter War against the Soviet Union. These aircraft included a late production SB-2-M-103, which was refurbished and delivered to the *Ilmavoimat* (Finnish Air Force) as SB-8 on 30 August 1941. This bomber was selected for conversion into a trainer, which was similar in standard to the Tupolev USB. SB-8 differed from the other Finnish SBs in having the landing light moved from the left leading edge to the right leading edge. SB-8's conversion was completed on 25 January 1943 and it was assigned to *Täydennyslentolaivue* (T-LeLv; Advanced Training Squadron) 17 at Luonetjärvi the following 19 February. The trainer was later assigned to *Pommilentolaivue* (PL-LeLv; Bomber Squadron) 46 at Luonetjärvi and then with LeLv 45. On 24 February 1945, the Finnish USB was stored after 268 flight hours in *Ilmavoimat* service.

The first Polish pilots trained on the USB with the 9th Group at Hoguruslanin in the Soviet Union. Five USBs were delivered to the Aviation Officers School at Deblin after World War Two ended in 1945. Two years later, Poland's USBs were re-engined with M-105 engines. The new powerplant required a redesign of the exhaust collector system, while VISH-61P propellers with more ogival spinners were installed. Three of the five USBs (serial numbers 10-116, 20-938 and 22-382) served with the Aviation Officers School until August of 1949. The Tupolev USB served longer in Poland than in any other country outside the Soviet Union.

The Soviet Union supplied five USBs to Poland soon after World War Two ended in 1945. They were retrofitted with 1100 hp Klimov M-105 engines with a modified exhaust collector system in 1947. Simultaneously, VISH-61P propellers with more ogival spinners were fitted. The Polish USBs remained in service until August of 1949. (Andrzej Morgata)





(Above) A Spanish Republican SB-2-M-100-A (34/BK-77) assigned to Grupo (Group) 24 flies over Nationalist airspace in early 1939. A Messerschmitt Bf 109E (6+111) of 2.J/88, Legion Condor attacked this *Katiuska*. The SB was the most numerous bomber flown by Republican forces during the Spanish Civil War.

(Below) The *Ilmavoimat* (Finnish Air Force) operated several SBs captured from Soviet forces in combat. This SB-2-M-103 (SB-11) was assigned to Lentolaivue (LeLv; Flying Squadron) 6 at Nummela in 1942. It was employed on anti-submarine patrols over the Gulf of Finland.

